



TETRA TECH

December 12, 2016

Ms. Erin McCoy
Remedial Project Manager
U.S. Environmental Protection Agency, Region 7
11201 Renner Blvd
Lenexa, Kansas 66219

Subject: **Draft Focused Feasibility Study**
Des Moines TCE NPL Site, Operable Unit 02/04, Building Demolition
Des Moines, Iowa
U.S. EPA Region 7 START 4, Contract No. EP-S7-13-06, Task Order No. 0144
Task Monitor: Erin McCoy

Dear Ms. McCoy:

Tetra Tech, Inc. is submitting the attached draft Focused Feasibility Study report regarding the Des Moines TCE NPL site, Operable Unit 02/04, Building Demolition, in Des Moines, Iowa. If you have any questions or comments, please contact me at (816) 412-1767.

Sincerely,

Mike Williams
START Project Manager

Ted Faile, PG, CHMM
START Program Manager

Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

**DES MOINES TCE NPL SITE
OPERABLE UNIT 02/04
BUILDING DEMOLITION
DES MOINES, IOWA
DRAFT FOCUSED FEASIBILITY STUDY**

**Superfund Technical Assessment and Response Team (START) 4
Contract No. EP-S7-13-06, Task Order 0144**

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Blvd.
Lenexa, Kansas 66219

December 12, 2016

Prepared By:

Tetra Tech, Inc.
415 Oak Street
Kansas City, Missouri 64106
(816) 412-1741

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ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
COC	Chemical of concern
DICO	DICO, Inc.
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
HDPE	High-density polyethylene
IAC	<i>Iowa Administrative Code</i>
IC	Institutional control
KDHE	Kansas Department of Health and Environment
LDR	Land disposal restriction
mil	0.001 inch
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAPS	National Emission Standards for Hazardous Air Pollutants
O&M	Operations and maintenance
OMB	Office of Management and Budget
OU	Operable unit
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
ppm	Parts per million
RAO	Remedial Action Objective
RACER	Remedial Action Cost Engineering and Requirements
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SPA	South Pond Area
START	Superfund Technical Assistance and Response Team
TBD	To be determined
TCE	Trichloroethene
Tetra Tech	Tetra Tech, Inc.
TSCA	Toxic Substances Control Act
US	United States
U.S.C.	<i>United States Code</i>

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) directed the Tetra Tech Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) to prepare a Focused Feasibility Study (FS) report regarding the Des Moines Trichloroethene (TCE) Site (site) in Des Moines, Iowa (Figure 1). An FS is a mechanism for developing, screening, and evaluating alternatives for remedial actions to address risk identified during previous site investigations. The purpose of this Focused FS is to support an update of the 1996 FS prepared by Black and Veatch (Black and Veatch 1996).

The site is in south-central Des Moines on the east side of the Raccoon River (Figure 1). The site is a 43-acre property formerly operated by DICO, Inc. (DICO). It is southwest of the intersection of W. Martin Luther King Jr. Parkway and SW 16th Street in Des Moines, Polk County, Iowa. The site is within Section 8, Township 78 North, Range 42 West. The site includes the Office Building, Production Building, and Buildings 1, 2, and 3; and slab foundations remaining for the Maintenance Building and Buildings 4 and 5. A surface water feature at the south end of the site is referred to as the “South Pond Area” (SPA). The SPA was identified in the 1996 FS as part of Operable Unit 4 (OU4), called the South Pond/Drainage Area Source Control OU. It was delineated to address pesticide contamination in soils and buildings in the southeast portion of the site.

For approximately 40 years, historical operations at the site have included a variety of industrial uses and operations—steel wheel manufacturing, chemical and herbicide distribution, and pesticide formulation processes. Releases during DICO’s operations at the site included the following: TCE, 1,2-dichloroethene (DCE), and vinyl chloride in groundwater; residual pesticides and metals in shallow soils; and pesticides within buildings and soils on the southern end of the property, and within drainage areas. See the 1996 FS for more information (Black and Veatch 1996). The site is divided into four OUs:

- ☐ OU1 – groundwater TCE plume
- ☐ OU2 – originated as source soils associated with TCE groundwater contamination, but later focused on residual pesticides and metals in shallow soils
- ☐ OU3 – source area of tetrachloroethene (PCE) groundwater contamination north of the site
- ☐ OU4 – pesticides in soil and buildings on the southern end of the site (a.k.a., SPA), and in drainage areas of the site.

The 1986 Record of Decision (ROD) addressed OU1 (EPA 1986), the 1992 ROD addressed OU3 (EPA 1992), and the 1996 ROD addressed OU2 and OU4 (EPA 1996). In the mid-1990s, several cleanup actions occurred to address contamination at the site in surface soils and buildings. Furthermore, a group

of potentially responsible parties excavated contaminated soils from a drainage ditch adjacent to the site and from the SPA (EPA 2012).

Manufacturing operations at the site have ceased, and the only activities on site relate to operation and maintenance of remediation systems. The site is fenced and the property owner provides site security.

Land use in the surrounding area is changing, and much of this area has been rezoned. The City of Des Moines is planning a major redevelopment project in the River Point West area east of the site.

This Focused FS report was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA's "Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)" (EPA 1988). The NCP defines appropriate remediation as a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of human health, welfare, and the environment. Remedial alternatives evaluated in this Focused FS report vary in cost and in level of protection they afford to human health.

This Focused FS report evaluates alternatives for addressing human health risk associated with the buildings and slabs that remain on site. Figure 2 is a site layout map.

2.0 REMEDIAL ACTION OBJECTIVES AND PRELIMINARY REMEDIATION GOALS

Several pesticides detected in samples of building materials and concrete, and in wipe samples contained Resource Conservation and Recovery Act (RCRA) listed wastes. The pesticides detected are listed hazardous wastes because of DICO's previous regulated activities of pesticide formulation. In addition, polychlorinated biphenyls (PCB) exceeding 50 parts per million (ppm) are potentially relevant and appropriate as discussed in Section 4.0, Table 1. Therefore, remedial action objectives (RAO) are all pesticides detected plus PCBs exceeding 50 ppm (i.e., 50 mg/kg). RAOs apply to building materials only and do not address soil in this Focused FS.

3.0 EXTENT OF CONTAMINATION

In July 2016, Tetra Tech conducted an environmental characterization of buildings, foundations, soil below buildings, and the SPA. The South Pond characterization is included in the South Pond FS (Tetra Tech 2016b). The building investigation included collection of the following samples for analyses for chemicals of concern (COC):

- ☐ Wipe samples from building surfaces
- ☐ Building material samples
- ☐ Concrete core samples from building foundations and slabs

Results of the site characterization indicated presence of pesticides, PCBs, and dioxins in several building materials across the site. Pesticides and PCB sample locations are shown on Figures 3 through 5; analytical summary tables of pesticides and PCBs (Tables Building 1 through 3) correspond to each figure. Total volume of contaminated building materials is estimated at approximately 82,000 cubic yards.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CERCLA Section (§) 121(d)(1) requires that remedial actions attain (or the decision document justify waiver of) environmental regulations, standards, or criteria promulgated under federal or more stringent state laws determined to be applicable or relevant and appropriate requirements (ARAR).

The NCP at 40 *Code of Federal Regulations* (CFR) § 300.5 defines applicable requirements as “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site...” The NCP at 40 CFR § 300.5 defines relevant and appropriate requirements as “those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not ‘applicable’ to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations *sufficiently similar to those encountered at the CERCLA site and that their use is well suited to the particular site...*” (emphasis added).

Compliance with ARARs requires compliance only with the substantive requirements specified within the statute or regulation, and does not require compliance with procedural requirements, such as permitting. CERCLA § 121(e)(1) states that “No Federal, State, or local permit shall be required for the portion of any removal or remedial action conducted entirely onsite, where such remedial action is selected and carried out in compliance with this section.” For any portion of a removal or remedial action conducted off site, such as off-site disposal in a permitted landfill, compliance only with applicable requirements is necessary (not relevant and appropriate), and compliance with both substantive and procedural components is required.

On behalf of EPA, Tetra Tech has identified potential federal ARARs, and has worked collaboratively with the State of Iowa Department of Natural Resources to identify potential state ARARs. For a state requirement, including an applicable state requirement, to be identified as a potential state ARAR, the requirements must be more stringent than the corresponding federal ARAR. EPA will select the final ARARs (no longer potential) and reveal these in the ROD.

ARARs are generally divided into three categories: chemical-, location-, and action-specific requirements. Chemical-specific ARARs are generally health- or risk-based numerical values or methodologies applied to site-specific conditions that result in establishment of cleanup levels. These values establish acceptable amounts or concentrations of chemicals that may be found in, or discharged

to, the ambient environment. No potential chemical-specific ARARs were identified. Location-specific ARARs are restrictions placed on concentrations of hazardous substances or protected locations, including historic places, wetlands, and sensitive ecosystems or habitats. No protected or regulated resources are present at the building site, so no potential location-specific ARARs were identified. Potential location Action-specific ARARs are requirements that are triggered by a remedial action being conducted on-site. Action-specific ARARs generally do not determine the remedial alternative; rather they determine how an alternative must be completed. Potential Federal action-specific ARARs are listed in Table 1. Potential State action-specific ARARs are listed in Table 2. Table 3 contains a summary of feasibility options.

TABLE 1

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition and Disposal (Alternative 2)					
Resource Conservation and Recovery Act					
Generate waste	Person who generates waste shall determine if the waste is a RCRA hazardous waste.	Generator of waste	40 CFR §§ 262.10(a), 262.11	Applicable	These regulations are potentially applicable to the off-site disposal of building debris (waste). EPA would determine whether the waste is RCRA hazardous waste when it is generated.
Generate waste	Provides requirements for analyzing waste for determining whether waste is hazardous.	Generator of waste	40 CFR § 264.13	Applicable	These regulations are potentially applicable to the off-site disposal of building debris (waste). EPA would determine whether the waste is RCRA hazardous waste when it is generated.
Temporarily stage debris for off-site disposal	Allows generators to accumulate solid remediation waste in a staging pile designed and operated pursuant to these requirements without triggering LDRs or minimum technology requirements. In addition, activities intended to prepare the waste for subsequent management or treatment are allowed to occur in staging piles.	RCRA hazardous waste temporarily staged for off-site disposal	40 CFR §264.554	Applicable	EPA would temporarily stage the building debris in order to segregate the various waste streams prior to off-site disposal.
Close temporary staging pile	Close the staging pile in a way that minimizes need for further maintenance controls, and minimizes or eliminates post-closure escape of hazardous waste or hazardous constituents.	RCRA hazardous waste management facility	40 CFR § 264.111	Applicable	These requirements are potential ARARs for closing the temporary staging pile.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Close temporary staging pile	At closure, owner shall remove or decontaminate all waste residues, contaminated containment system components, contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste. If waste is left on site, post-closure care shall be performed in accordance with the closure and post-closure care requirements that apply to landfills.	RCRA hazardous waste pile	40 CFR § 264.258(a)	Applicable	These requirements are potential ARARs for closing the temporary staging pile.
Generate waste	A generator of waste shall determine if the waste has to be treated before it can be land disposed, which may occur concurrently with the hazardous waste determination required in 40 CFR § 262.11	Waste	40 CFR § 268.7	Applicable	These regulations are potentially applicable to the building debris to be sent off site for disposal (waste). EPA would determine if the waste is RCRA hazardous waste when it is generated.
Generate waste	The initial generator of a waste shall determine each EPA hazardous waste number (waste code) in order to determine the applicable treatment standards, which may occur concurrently with the hazardous waste determination required in 40 CFR § 262.11.	Waste	40 CFR § 268.9	Applicable	These regulations are potentially applicable to the building debris to be sent off site for disposal (waste). EPA would determine if the waste is RCRA hazardous waste when it is generated.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Generate waste	EPA may grant variance from an LDR treatment standard.	RCRA hazardous waste subject to LDRs	40 CFR § 268.44	Applicable	These regulations are potentially applicable to the building debris to be sent off site for disposal (waste). EPA would determine if the waste is RCRA hazardous waste when it is generated.
Generate waste	Treatment standards for hazardous debris.	RCRA hazardous waste subject to LDRs	40 CFR § 268.45	Applicable	Hazardous debris must be treated prior to land disposal unless EPA determines under 40 CFR § 261.3(f)(2) that the debris no longer contains hazardous waste or the debris is treated to the waste-specific treatment standards specified in 40 CFR § 268.45.
Clean Air Act					
Building demolition	Owner or operator of a demolition or renovation activity must thoroughly inspect the affected facility where the demolition will occur for presence of asbestos. If asbestos is found, the owner or operator must comply with the notification requirements of 40 CFR § 61.145(b) and the procedures for asbestos emission control specified in 40 CFR § 61.145(c).	Demolition of any institutional, commercial, public, industrial, or residential structure with less than four units	40 CFR § 61.145	Applicable	The substantive provisions of the NESHAPS for asbestos are applicable to demolition of the building. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, EPA will comply with the substantive procedures in 40 CFR § 61.145(c).

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building demolition	Each owner or operator of a source must (1) discharge no visible emissions to the outside air during collection, processing, packaging, and transporting; (2) deposit the asbestos-containing waste at the waste disposal site as soon as is practical; (3) mark vehicles used to transport asbestos-containing waste; (4) maintain transportation records; and (5) make records available for inspection.	Owner or operator of a source of asbestos emissions (including a source regulated under 40 CFR § 61.145)	40 CFR § 61.150	Applicable	The substantive provisions of the NESHAPs for asbestos disposal are applicable to asbestos-containing waste identified in the building demolition.
Toxic Substances Control Act					
Building demolition	PCB remediation waste may be sent off site for decontamination or disposal provided the waste is either dewatered on site or transported off site in containers meeting the requirements of the DOT hazardous material regulations at 49 CFR parts 171-180	PCB remediation waste at concentrations \geq 50 ppm PCBs.	40 CFR § 761.61(5)(i)(B)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation is not identified as applicable, but is identified as relevant and appropriate to PCBs present in a building as a result of a spill or release into the building. PCBs may be present in the building as a result of a release. If so, the building materials will be disposed of at an appropriate landfill.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building demolition	PCB bulk product waste must be disposed of in accordance with: (1) performance-based disposal; (2) disposal in solid waste landfills; or (3) risk-based disposal approval	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state, at any concentration at time of designation for disposal ≥ 50 ppm PCBs	40 CFR § 761.62(b)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation is not identified as applicable, but is identified as relevant and appropriate to PCBs present in building materials from manufactured products (not as a result of a spill). PCB bulk product waste may be present in the building materials. If so, the building materials will be disposed of at an appropriate solid waste landfill; however, if the PCB bulk product waste is not segregated from other RCRA hazardous or PCB remediation waste, the PCB bulk product waste will be disposed of at a permitted hazardous waste landfill.
Clean Water Act					
Building demolition	Construction activities that disturb 1 acre or more must use best management practices to control stormwater discharges.	Construction activities encompassing 1 acre or more.	Clean Water Act § 402 40 CFR §122.44(k)(2) and (4)	Relevant and appropriate	The demolition will affect 1 acre or more, so the stormwater discharge requirements are applicable. Best management practices will be used to control stormwater discharge to nearby surface water bodies. See Table 2, Potential State ARARs, for a discussion of compliance with these Clean Water Act ARARs.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition and Capping (Alternative 3)					
Resource Conservation and Recovery Act					
Construct cover over crushed building debris left on site	The owner or operator must close the facility in a manner that minimizes need for further maintenance; and controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface water or atmosphere.	RCRA hazardous waste management facility	40 CFR § 264.111	Applicable	These requirements are applicable for leaving RCRA listed hazardous waste (building debris) closed in place.
Construct cover over crushed building debris left on site	Post-closure use of the property on or in which hazardous waste remains after partial or final closure must never be allowed to disturb the integrity of the final cover, liner, or any other components of the containment system, or function of the facility's monitoring systems.	RCRA hazardous waste management facility	40 CFR § 264.117(c)	Applicable	These requirements are applicable for leaving RCRA listed hazardous waste (building debris) closed in place.
Construct cover over crushed building debris left on site	A map showing the exact location and dimensions of each waste management cell with respect to permanently surveyed benchmarks must be prepared.	RCRA hazardous waste landfill	40 CFR § 264.309(a)	Applicable	These requirements are applicable for leaving RCRA listed hazardous waste (building debris) closed in place.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Construct cover over crushed building debris left on site	Final cover design and construction requirements.	RCRA hazardous waste landfill	40 CFR §264.310	Applicable	These requirements are applicable for leaving RCRA listed hazardous waste (building debris) closed in place.
Monitor groundwater	Owners and operators of landfills that dispose of hazardous waste must implement a groundwater monitoring program to detect, characterize, and respond to releases to the uppermost aquifer unless the owner or operator is exempt from this requirement, including a finding of no potential for migration of liquid from a regulated unit to the uppermost aquifer during the active life of the regulated unit and the post-closure period.	RCRA hazardous waste landfill	40 CFR §§ 264.90 and 264.91	Applicable	These requirements are applicable to RCRA hazardous waste disposal sites. These regulations require groundwater monitoring unless the owner or operator falls within an exception, including a finding of no potential for migration of liquids into groundwater.
Clean Air Act					
Building demolition	Owner or operator of a demolition or renovation activity must thoroughly inspect the affected facility where the demolition will occur for presence of asbestos. If asbestos is found, the owner or operator must comply with the notification requirements of 40 CFR § 61.145(b) and the procedures for asbestos emission control of 40 CFR § 61.145(c).	Demolition of any institutional, commercial, public, industrial, or residential structure with less than four units	40 CFR § 61.145	Applicable	The substantive provisions of the NESHAPS for asbestos are applicable to demolition of the building. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, EPA will comply with the substantive procedures in 40 CFR § 61.145(c).

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building demolition	Each owner or operator of a source must (1) discharge no visible emissions to the outside air during collection, processing, packaging, and transporting; (2) deposit the asbestos-containing waste at the waste disposal site as soon as is practical; (3) mark vehicles used to transport asbestos-containing waste; (4) maintain transportation records; and (5) make records available for inspection.	Owner or operator of a source of asbestos emissions (including a source regulated under 40 CFR § 61.145)	40 CFR § 61.150	Applicable	The substantive provisions of the NESHAPs for asbestos disposal are applicable to asbestos-containing waste identified in the building demolition. An asbestos survey will be completed prior to demolition of the building. If asbestos-containing materials are found, EPA will remove the asbestos and dispose of it off site.
Toxic Substances Control Act					
PCB waste from building demolition	PCB remediation waste in low-occupancy areas may remain at a cleanup site at concentrations > 25 ppm and ≤ 100 ppm if the site is covered with a cap meeting the requirements of paragraphs (a)(7) and (a)(8)	PCB remediation waste at concentrations ≥ 50 ppm PCBs.	40 CFR § 761.61(a)(4)(i)(B)(3)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation is not identified as applicable, but is identified as relevant and appropriate to PCBs present in a building as a result of a spill or release into the building. PCBs may be present in the building as a result of a release and would be disposed of under a TSCA-compliant cover.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
PCB waste from building demolition	Where there is an actual or proposed change in use of an area cleaned up to the levels of a low-occupancy area, and exposure of people or animal life in or at that area could reasonably be expected to increase, resulting in a change in status from a low-occupancy area to a high-occupancy area, the owner of the area shall clean up the area in accordance with the high-occupancy area cleanup levels in paragraphs (a)(4)(i) through (a)(4)(iv) of this section.	PCB remediation waste at concentrations \geq 50 ppm PCBs.	40 CFR § 761.61(a)(4)(v)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation is not identified as applicable, but is identified as relevant and appropriate to PCBs present in a building as a result of a spill or release into the building. In addition, this regulation is relevant and appropriate to on-site disposal of PCB bulk product waste that will be disposed of under the TSCA-compliant cover with the PCB remediation waste. ICs will limit the area to low-occupancy re-use.
PCB waste from building demolition	Any person designing and constructing a cap must do so in accordance with 40 CFR § 264.310(a) and ensure that it complies with the permeability, sieve, liquid limit, and plasticity index parameters in § 761.75(b)(1)(ii) through (b)(1)(v). A cap of compacted soil shall have a minimum thickness of 10 inches; a concrete or asphalt cap shall have a minimum thickness of 6 inches. A cap must be of sufficient strength to maintain its effectiveness and integrity when exposed to the environment.	PCB remediation waste at concentrations \geq 50 ppm PCBs.	40 CFR §§ 761.61(a)(7), 761.65(b)(1)(i) through (b)(1)(v)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, these regulations are not identified as applicable, but are identified as relevant and appropriate to PCBs present in a building as a result of a spill or release into the building. PCBs remediation waste will be disposed of under a cover meeting these requirements.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
PCB waste from building demolition	When a cleanup activity under this section includes use of a fence or a cap, the owner of the site must maintain the fence or cap in perpetuity.	PCB remediation waste at concentrations \geq 50 ppm PCBs.	40 CFR § 761.61(a)(8)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, these regulations are not identified as applicable, but are identified as relevant and appropriate to PCBs present in a building as a result of a spill or release into the building. In addition, these regulations are relevant and appropriate to on-site disposal of PCB bulk product waste, which will be disposed of under the cap.
PCB waste from building demolition	PCB bulk product waste must be disposed of in accordance with: (a) performance-based disposal; (b) disposal in solid waste landfills; or (c) risk-based disposal approval	PCB bulk product waste means waste derived from manufactured products containing PCBs in a non-liquid state at any concentration at time of designation for disposal \geq 50 ppm PCBs	40 CFR § 761.62(c)	Relevant and appropriate	In the promulgation of the TSCA rule at 40 CFR § 761.61, EPA stated that Part 761 does not bind other cleanup programs such as CERCLA or RCRA; however, EPA expects that CERCLA cleanups would typically comply with one of the three cleanup options provided in § 761.61. Therefore, this regulation is not identified as applicable, but is identified as relevant and appropriate to PCBs bulk product waste. PCB bulk product waste will be disposed of under the cover that complies with the RCRA and TSCA cover ARARs (identified above with the PCB remediation waste) and so would be protective of human health and the environment.

TABLE 1 (Continued)

**POTENTIAL FEDERAL ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Clean Water Act					
Construct cover over crushed building debris left on site	Construction activity that disturbs 1 acre or more must use best management practices to control stormwater discharges.	Construction activities encompassing at least 1 acre.	Clean Water Act § 402 40 CFR §122.44(k)(2) and (4)	Applicable	Construction will not affect 1 acre or more, so the stormwater discharge requirements are not applicable. However, best management practices will be used to control stormwater discharge to nearby surface water bodies. See Table 2, Potential State ARARs, for a discussion of compliance with these Clean Water Act ARARs.

Notes:

§	Section
ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
IC	Institutional controls
LDR	Land disposal restriction
NESHAPS	National Emission Standards for Hazardous Air Pollutants
PCB	Polychlorinated biphenyl
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
US	United States
U.S.C.	<i>United States Code</i>

TABLE 2

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition and Disposal (Alternative 2)					
Clean Water Act					
Building demolition	Construction activities that disturb 1 acre or more must use best management practices to control stormwater discharges.	Construction activities that affect 1 acre or more.	Clean Water Act § 1342 40 CFR §122.44(k)(2) and (4)	Applicable	<p>Building demolition will affect more than 1 acre, so the stormwater discharge requirements are applicable. Best management practices will be used to control stormwater discharge to nearby surface water bodies.</p> <p>Pursuant to CERCLA § 121(e), permits are not required for the portions of the remedial action that occur entirely on site. The stormwater discharge will occur entirely on site; therefore, EPA is not required to obtain a permit to discharge the stormwater. However, EPA will use the substantive provisions of Iowa General Permit 2 (Storm Water Management for Construction Activities) as a means of complying with Clean Water Act requirements.</p>

TABLE 2 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Building Demolition and Capping (Alternative 3)					
Clean Water Act					
Construct cover	Construction activities that disturb 1 acre or more must use best management practices to control stormwater discharges.	Construction activities that effect 1 acre or more.	Clean Water Act § 1342 40 CFR §122.44(k)(2) and (4)	Applicable	<p>Construction of the cover will affect more than 1 acre, so the stormwater discharge requirements are applicable. Best management practices will be used to control stormwater discharge to nearby surface water bodies.</p> <p>Pursuant to CERCLA § 121(e), permits are not required for the portions of the remedial action that occur entirely on site. The stormwater discharge will occur entirely on site; therefore, EPA is not required to obtain a permit to discharge the stormwater. However, EPA will use the substantive provisions of Iowa General Permit 2 (Storm Water Management for Construction Activities) as a means of complying with Clean Water Act requirements.</p>

TABLE 2 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Iowa land Recycling Program and Response Action Standards					
Technological controls	The purpose of a technological control is to effectively sever a pathway by use of technologies such that an applicable receptor could not be exposed to hazardous substances at concentrations above respective applicable target risk levels. Proposal for any technological control as a permanent response action option that would not reduce contaminant concentrations to at or below target risk levels must establish that the pathway to a receptor would be permanently severed or controlled.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(1)	Relevant and appropriate	These requirements are not applicable because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate to the cover evaluated in Alternative 3 that would be used to prevent exposure to contaminated building debris remaining on site.
Impose an IC	The purpose of an IC is to restrict access to or use of an affected area such that current or future receptors could not be exposed to hazardous substances. ICs can include: (1) a state or federal law or regulation; (2) a local ordinance; (3) a recorded contractual obligation; (4) informational devices; or (5) an environmental covenant pursuant to the Uniform Environmental Covenants Act.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(2)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for establishing the ICs necessary to prevent human health exposure to contaminated building debris remaining on site.

TABLE 2 (Continued)

**POTENTIAL STATE ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
DES MOINES TCE SITE, DES MOINES, IOWA**

Action	Requirement	Prerequisite	Citation	Preliminary ARAR Determination	Comments
ALTERNATIVES					
Modify or terminate an IC or technological control	A participant or owner of property subject to an IC may seek approval from the department for removal, discontinuance, modification, or termination of an IC.	A contaminated site enrolled in the Land Recycling Program	IAC § 137.7(8)	Relevant and appropriate	These requirements are not applicable to the ICs under evaluation because neither the building nor the site is enrolled in the Land Recycling Program. These requirements are potentially relevant and appropriate for modifying or terminating ICs imposed on the site to prevent exposure to contaminated building debris remaining on site.
Uniform Environmental Covenants Act					
Prohibit future uses of or activities at the site	Land use and activity restrictions must be described and embodied in an environmental covenant recorded in every county in which any portion of the real property subject to the environmental covenant is located.	A land use or activity restriction necessary to prevent exposure to contamination	Title XI, Iowa Code, Chapter 455I	Applicable	Land use and activity restrictions are necessary to prevent exposure to contaminated building debris remaining on site, and to maintain the integrity of the final cover.

Notes:

§ Section
 ARAR Applicable or relevant and appropriate requirement
 CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
 CFR Code of Federal Regulations
 CWA Clean Water Act
 EPA U.S. Environmental Protection Agency

IAC Iowa Administrative Code
 IC Institutional control
 NCP National Oil and Hazardous Substances Control Plan
 RCRA Resource Conservation and Recovery Act
 TCE Trichloroethene
 U.S.C. United States Code

5.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

EPA directed Tetra Tech to evaluate three alternatives addressing buildings and slabs that remain at the site, applying the nine criteria described in CERCLA (EPA 1988). The first alternative, which serves as a baseline, is known as the “No Action” alternative. The second alternative is building demolition and disposal (Figure 6). The third alternative is building demolition with crushing building material on site, spreading the material across the site, and covering the fill with a cap (Figure 7). The following sections describe these three alternatives.

5.1 ALTERNATIVE 1 – NO ACTION (BASELINE)

Alternative 1 is the CERCLA-required no-action alternative in which no remediation is undertaken. This alternative does not include land use controls, containment, removal, treatment, or other mitigating actions. It does include a 5-year review by EPA to evaluate effectiveness. Under Alternative 1, because no action is taken, the site remains unchanged. Building contaminants that pose risk to human health would remain in place. Because no action is taken, no cost is associated with this option. The no action alternative provides a baseline for comparison to the other remedial response alternatives. Alternative 1 would have minimal costs associated with required 5-year reviews.

5.2 ALTERNATIVE 2 – BUILDING DEMOLITION AND DISPOSAL

Alternative 2 includes demolition of all buildings and slabs remaining on site, and disposal of demolition debris at an off-site landfill. Based on the July 2016 sampling event, building materials contain P and U listed wastes. Assumptions for Alternative 2 are as follows:

1. The walkway between Buildings 2 and 3 and the Office Building has no contamination and therefore can be disposed of as non-hazardous waste.
2. All remaining slab foundations will be removed.
3. Demolition equipment will require decontamination. Equipment decontamination operations are anticipated to last 1 week. Costs include construction of a decontamination facility pad and disposal of wash water. Approximately 50 55-gallon drums of wash water will be generated during decontamination activities. Wash water will be hazardous.
4. Roofing tar and boiler/piping insulation contain asbestos, and will be abated prior to demolition of buildings. This will be classified as asbestos-containing material (ACM) and disposed of as

special waste. This includes roofing at the Office Building, Production Building, and Buildings 1, 2, and 3; and boiler/piping insulation at Building 1.

5. Collection of an estimated 100 samples is anticipated during the Asbestos Survey. Costs for this survey and report were estimated by application of the "RCRA Facility Investigation" technology in RACER. Assemblies were removed that did not apply.
6. All demolition debris from the following is hazardous waste based on detections of RCRA P and U listed wastes: Production Building, and Buildings 1, 2, and 3; and slab foundations remaining from the Maintenance Building and Buildings 4 and 5.
7. Disposal of hazardous demolition debris will occur at a Toxic Substance Control Act (TSCA)-approved and RCRA Subtitle C landfill in Utah. Transportation and disposal charges will be \$265.00 per ton, based on estimates received from disposal facilities.
8. The volume to weight conversion factor is 0.625 tons per cubic yard based on the Kansas Department of Health and Environment (KDHE) Bureau of Waste Management (KDHE 2010). An Iowa-specific weight conversion was not found.
9. No soil will be removed as part of this alternative.
10. Land Disposal Restrictions will not apply.

5.3 ALTERNATIVE 3 – BUILDING DEMOLITION AND CAPPING

Alternative 3 includes demolition of all buildings and slabs remaining on site, crushing the building debris, spreading the debris across the site, and covering the fill with a cap. Based on the July 2016 sampling event, building materials contain P and U listed wastes. Assumptions for Alternative 3 are as follows:

1. The walkway between Buildings 2 and 3 and the Office Building has no contamination and therefore can be disposed as non-hazardous waste.
2. All remaining slab foundations will be removed.
3. Demolition equipment will require decontamination. Equipment decontamination operations are anticipated to last 1 week. Costs include construction of a decontamination facility pad and disposal of wash water. Approximately 50 55-gallon drums of wash water will be generated during decontamination activities. Wash water will be hazardous.
4. Roofing tar and boiler/piping insulation contain asbestos and will be abated prior to demolition of buildings. This will be classified as ACM and disposed of as special waste. This includes

roofing at the Office Building, Production Building, and Buildings 1, 2, and 3; and boiler/piping insulation at Building 1.

5. Collection of an estimated 100 samples is anticipated during the Asbestos Survey. Costs for this survey and report were estimated by application of the "RCRA Facility Investigation" technology in RACER. Assemblies were removed that did not apply.
6. Building debris that cannot be crushed, such as rebar and steel beams, will be disposed of off-site at a hazardous waste landfill. The following cannot be crushed: 1% of slab foundations, 10% of masonry buildings, and 100% of steel buildings.
7. Crushed materials containing RCRA-listed waste will require regulated closure (e.g., RCRA-compliant cap) and monitoring.
8. Crushed materials will be spread on site and capped. The cap will include a 36-inch foundation layer (demolition debris), 24-inch compacted clay layer, 0.04-inch (40-mil) high-density polyethylene (HDPE) geomembrane composite barrier, geocomposite drainage layer, 6-inch protection layer, and 3-inch asphalt surface layer.
9. Disposal of hazardous demolition debris that cannot be crushed (e.g., rebar and steel beams) will occur at a TSCA-approved and RCRA Subtitle C landfill in Utah. Transportation and disposal charges will be \$265.00 per ton.
10. The volume to weight conversion factor is assumed to be 0.625 tons per cubic yard based on the KDHE Bureau of Waste Management Policy 10-01 (KDHE 2010). An Iowa-specific weight conversion was not found.
11. No soil will be removed as part of this alternative.
12. Land Disposal Restrictions will not apply.

6.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section evaluates remedial alternatives applying EPA guidelines for detailed analysis of alternatives in feasibility studies (EPA 1988). The nine evaluation criteria are also called NCP criteria. The first two are called threshold criteria, the next five are called primary balancing criteria, and the last two are called modifying criteria. The modifying criteria, “state acceptance” and “community acceptance,” are evaluated after receipt of public comment.

6.1 ALTERNATIVE 1 – NO ACTION (BASELINE)

The No Action alternative is required by the NCP and will serve as a comparative reference for other remedial alternatives.

6.1.1 Overall Protection of Human Health and the Environment

Alternative 1 would not be protective of human health or the environment. Contaminated building materials would continue to pose risk to human receptors above acceptable levels.

6.1.2 Compliance with ARARs

Alternative 1 would not comply with ARARs.

6.1.3 Long-Term Effectiveness and Permanence

Alternative 1 would not be effective in the long term, and would not be a permanent remedy. Risk posed by contaminated building materials would remain unmitigated.

6.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 does not include treatment and would therefore not reduce toxicity, mobility, or volume through treatment.

6.1.5 Short-Term Effectiveness

Alternative 1 would not provide any short-term effectiveness, but because it does not include construction, there would be no short-term risk from construction-related activities.

6.1.6 Implementability

Alternative 1 would be easy to implement physically because it would take no effort to implement. However, it would face administrative hurdles because it does not address risk.

6.1.7 Cost

No cost is associated with Alternative 1.

6.1.8 State Acceptance

It is unlikely that Alternative 1 would receive state acceptance because it does not mitigate risk.

6.1.9 Community Acceptance

It is unlikely that Alternative 1 would receive community acceptance because it does not mitigate risk.

6.2 ALTERNATIVE 2 – BUILDING DEMOLITION AND DISPOSAL

Alternative 2 involves removal of all building materials, including contaminated materials that contain a listed hazardous waste. After removal of building materials, grading of existing soil would likely occur, and a non-regulated cap (such as a thin layer of clean fill or parking lot) would cover the area formerly hosting the buildings and slab foundations.

6.2.1 Overall Protection of Human Health and the Environment

Alternative 2 rates high under this criterion. This alternative permanently reduces long-term risk to human receptors, and restores the area occupied by buildings to beneficial use. Contaminated material would be disposed of off-site. Short-term risk would be mitigated through safe work practices. Furthermore, this alternative would require no maintenance.

6.2.2 Compliance with ARARs

Alternative 2 would comply with ARARs.

6.2.3 Long-Term Effectiveness and Permanence

Alternative 2 rates high under this criterion because building materials posing risk would be removed. Contaminated soil would not be addressed by building removal; however risk would be mitigated

indirectly through a clean soil cover or parking lot. Groundwater monitoring and treatment are ongoing as part of the current ROD (EPA 1996). This alternative has a high degree of permanence. Contamination from building materials would not return after removal of the material because the known sources have been controlled. Risk of re-contamination by unknown sources on site would be small because the site is well characterized.

6.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 2 would reduce toxicity and volume of contaminants at the source through off-site disposal in a secure and regulated landfill.

6.2.5 Short-Term Effectiveness

Alternative 2 would have moderate short-term effectiveness. Some risk to workers and the community would be posed during building demolition. Risk to workers would be mitigated through safe work practices, including use of personal protective equipment, dust suppression, and air monitoring. Potential for spill of contaminated material, and increased potential for vehicle collisions due to construction traffic, would be the primary risks to the community.

6.2.6 Implementability

Alternative 2 would have high implementability. Technologies and skills necessary to implement the remedy would be readily available. Buildings and foundations could be demolished, crushed, or cut to required sizes and removed with reasonable accuracy. Similarly, clean fill or topsoil could be used for backfill, or a subgrade could be established in anticipation of a parking lot. Minor site-specific challenges may emerge during demolition and removal. Building demolitions, and removal and placement of fill or topsoil is expected to take 3 months.

6.2.7 Cost

The cost of Alternative 2 in 2016 dollars is estimated at \$28,243,000 for capital cost, \$55,000 for institutional controls (IC), and \$181,000 for operation and maintenance (O&M) for 5 years. The present value of future O&M is based on an annual discount rate of 1.5 percent obtained from Office of Management and Budget (OMB) Circular A-94. The estimated cost is sensitive to volume of building material that must be removed off site. Disposal costs for hazardous materials accounts for approximately 81% of the total cost of Alternative 2.

6.2.8 State Acceptance

State acceptance will be evaluated after receipt of public comment.

6.2.9 Community Acceptance

Community acceptance will be evaluated after receipt of public comment.

6.3 ALTERNATIVE 3 – BUILDING DEMOLITION AND CAPPING

Alternative 3 involves demolishing the buildings and foundations, and crushing all building debris and leaving it on site, roughly in place. The rubble would be overlain by a RCRA-compliant cap that would consist of a low-permeability layer and an asphalt cover. ICs would prevent actions that might compromise the remedy or otherwise expose receptors to buried contamination. Shallow groundwater would be monitored if soil-to-groundwater leaching is found to be a concern during the remedial design.

6.3.1 Overall Protection of Human Health and the Environment

Alternative 3 rates moderate to high under this criterion. This alternative reduces long-term risk to human receptors. However, the alternative would require maintenance and implementation of ICs to remain protective. Contaminants in concrete would be contained on site rather than removed. The already low short-term risk would be further mitigated through safe work practices.

6.3.2 Compliance with ARARs

Alternative 3 would comply with ARARs.

6.3.3 Long-Term Effectiveness and Permanence

Alternative 3 rates moderate to high under this criterion. Burying contaminated concrete under clean fill would isolate it from the environment and human receptors. It is unlikely that natural processes could uncover buried contaminated concrete; human actions that could uncover this material would be prohibited by ICs. The RCRA-compliant cap would limit infiltration of water through contaminated concrete. Leaching from building debris to groundwater is unlikely unless groundwater rises substantially. Groundwater is currently monitored as part of the ROD (EPA 1996). The cap would erode and settle over time and would require periodic grade correction to maintain its function. The cap would be designed to limit leaching. As such, this alternative would protect groundwater in the longterm.

6.3.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 3 does not involve treatment and therefore would not reduce toxicity, mobility, or volume of contaminants through treatment.

6.3.5 Short-Term Effectiveness

Alternative 3 rates moderate to high for short-term effectiveness. Potential for exposure of workers or the community to contaminated building materials would be small because most material would be left on site. There would be some potential for community exposure when the steel and other building materials are removed. Increased risk of vehicular collisions would be posed because of construction traffic, removal of some building material, and transport of clean fill to the site.

6.3.6 Implementability

Alternative 3 rates moderately high for implementability. The remedy is straightforward, but may require specialized equipment to cut steel and crush concrete. It would take approximately 4 months to implement. Alternative 3 involves demolishing buildings, cutting and removing steel, crushing concrete for fill, and installing a RCRA-compliant cap.

6.3.7 Cost

The cost of Alternative 3 in 2016 dollars is estimated at \$24,824,000 for capital cost, \$55,000 for ICs, and \$1,508,000 for O&M cost for 30 years. The present value of future O&M is based on an annual discount rate of 1.5 percent obtained from OMB Circular A-94. The estimated cost is sensitive to volume of non-crushable building material that must be removed off site, such as steel beams, reinforcement bars, metal sheeting, etc. The estimated cost is also sensitive to the design of the cap. Asphalt pavement and clay account for 71% of the cost of the cap.

6.3.8 State Acceptance

State acceptance will be evaluated after receipt of public comment.

6.3.9 Community Acceptance

Community acceptance will be evaluated after receipt of public comment.

7.0 SUMMARY AND CONCLUSIONS

Tetra Tech was tasked by EPA under EPA START 4 Contract No. EP-S7-13-06, Task Order No. 0144 to update—by addendum—the Des Moines TCE FS to prepare a Focused FS of removal of buildings and foundations. The site is in south-central Des Moines on the east side of the Raccoon River. The property is owned by DICO, and contamination at the site resulted mainly from DICO's operations over 40 years that included steel wheel manufacturing, and chemical and pesticide formulation.

Several pesticides detected in the building materials are listed hazardous wastes because of DICO's previous regulated activities of pesticide formulation.

Tetra Tech evaluated three remedial alternatives: (1) "No Action," which is the baseline alternative; (2) removal of all building materials, with the debris sent to a regulated disposal facility; and (3) demolition of the buildings and foundations, and crushing of all building debris that would then be left on site. Details of these remedial alternatives are presented in Section 6.0. Remedial alternatives were compared to nine regulatory criteria:

1. Overall protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance.

The results are summarized in Table 3.

TABLE 3
SUMMARY OF FEASIBILITY OPTIONS

Nine Criteria	Alt. 1: No Action	Alt. 2: Building Demo and Removal	Alt. 3: Building Demo and Capping
1. Protection	No.	Yes. Ranks High	Yes. Moderate to High
2. ARARs	No. Does not comply	Yes.	Yes.
3. Long-term Effect.	Not effective	Yes. Ranks High	Yes. Moderate to High
4. Reduction of Toxicity	No.	Yes.	No. Would not reduce toxicity, mobility
5. Short-term Effect.	Not effective, but no construction risk	Yes. Moderate	Yes. High
6. Implementability	Yes. Nothing required to implement	Yes. High	Yes. Moderate to High
7. Cost	No cost	Capital: \$28,243,000 ICs: \$55,000 O&M: \$181,000 Total: \$28,479,000	Capital: \$24,824,000 ICs: \$55,000 O&M: \$1,508,000 Total: \$26,387,000
8. State Acceptance	Unlikely. TBD	TBD	TBD
9. Community Acceptance	Unlikely. TBD	TBD	TBD

Notes:

IC Institutional controls
TBD To be determined
O&M Operation and maintenance

Based on results of this Focused FS, No Action (Alternative 1) does not comply with many of the nine criteria because it does not actively seek to reduce or eliminate risk to human health and the environment. It is the most cost-effective because nothing would be required to implement.

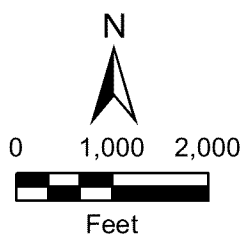
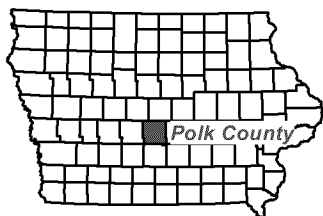
Building demolition and removal (Alternative 2) is the most expensive, but fulfills more of the nine criteria, including reducing toxicity and mobility of COCs. Finally, building demolition and capping (Alternative 3) satisfies many of the nine criteria and is less expensive than Alternative 2.

Details of cost assumptions are presented in Appendix A and B. Figures 6 and 7 show conceptual models of the two active remedial alternatives—Alternatives 2 and 3. State and community acceptance are not known and could influence stakeholder decision-making.

8.0 REFERENCES

- Black & Veatch Special Projects Corp. 1996. Final Feasibility Study for the Des Moines TCE Site Operable Unit Nos. 2 and 4, Des Moines, Iowa. May 30.
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FIGURES



Des Moines TCE Site
Des Moines, Iowa

Figure 1
Site Location Map

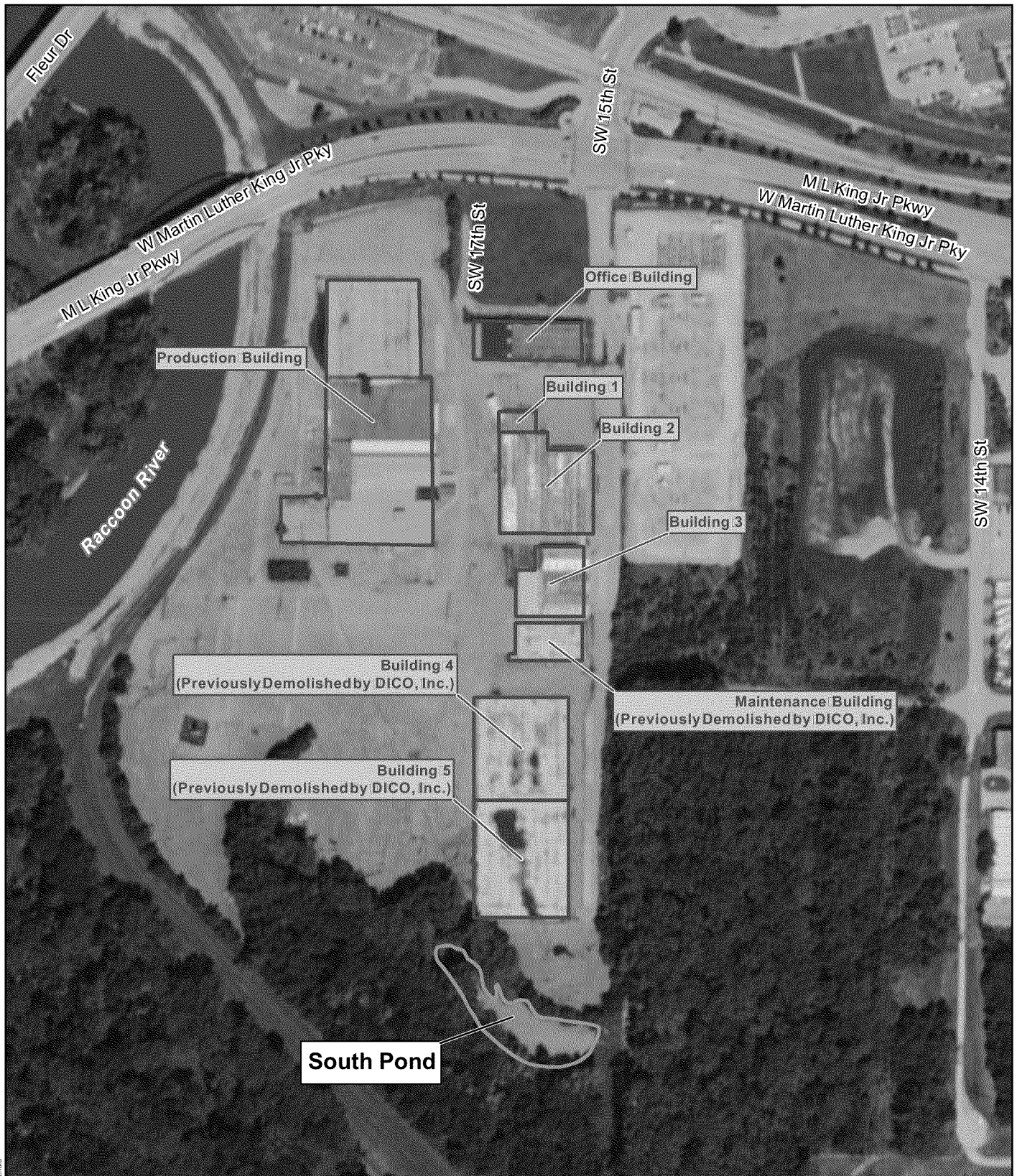


Source: USGS Des Moines SW, IA 7.5 Minute Topo Quad, 1976
USGS Des Moines SE, IA 7.5 Minute Topo Quad, 1976



Date: 9/29/2016

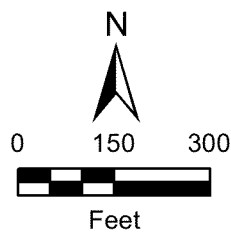
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

-  Building location
-  South pond area



Des Moines TCE Site
Des Moines, Iowa

Figure 2
Site Layout Map



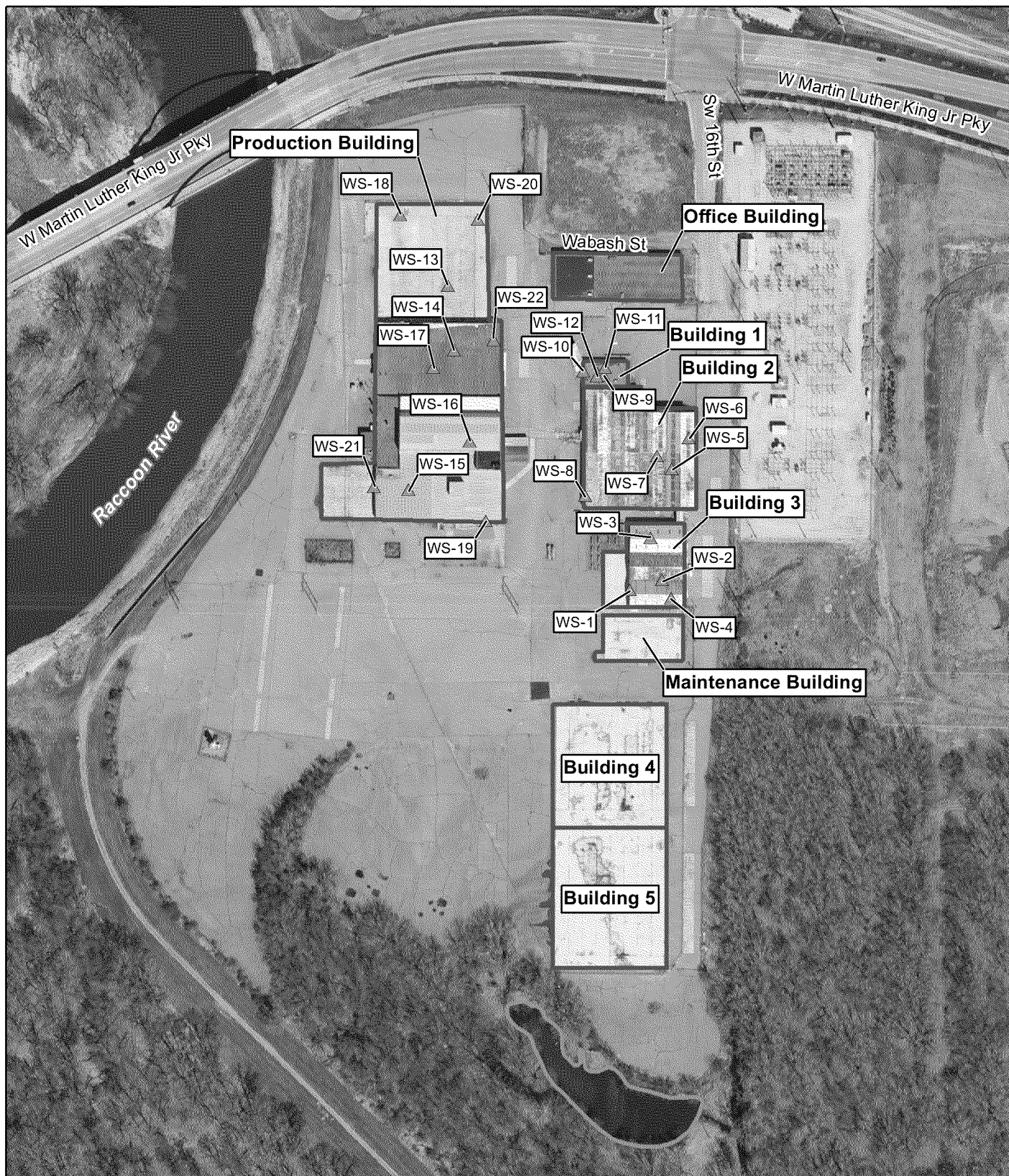
C:\START\WORK\Des Moines TCE\Figures\Figure2_SiteLayout.mxd

Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007




Date: 11/16/2016

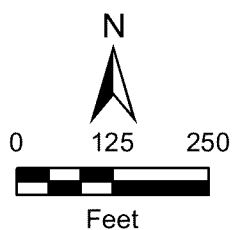
Drawn By: Michelle Handley

Project No: X9025.16.0144.000



Legend

-  Wipe sample location
-  Building location
-  South pond location



Des Moines TCE Site
Des Moines, Iowa

Figure 3
Wipe Sample Location Map

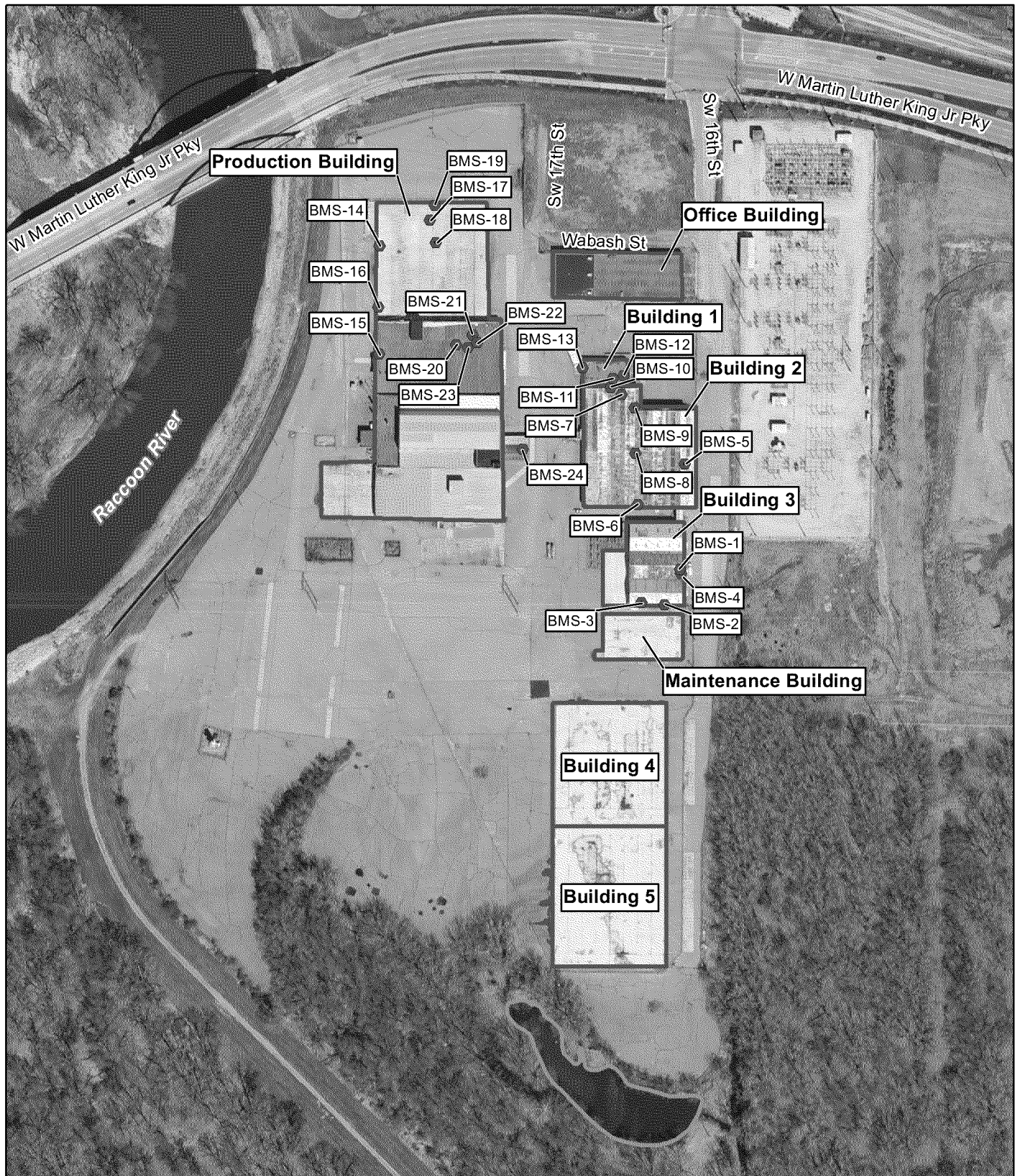


Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Date: 9/29/2016

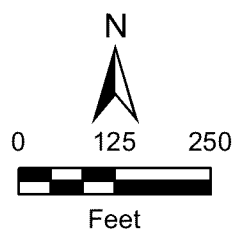
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

- Building material sample location
- Building location
- South pond location



Des Moines TCE Site
Des Moines, Iowa

Figure 4
Building Material Sample Location Map

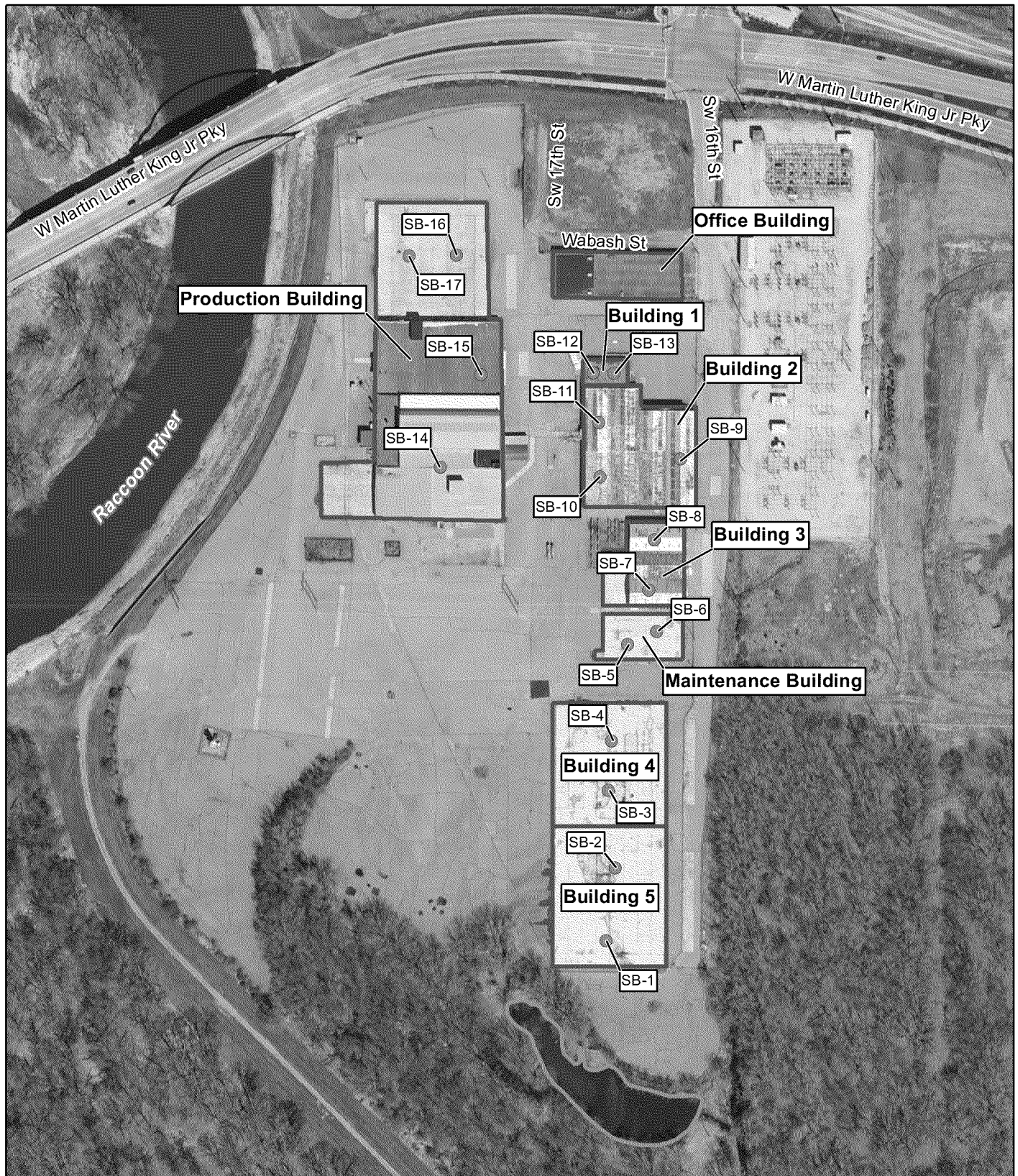


Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Date: 9/29/2016

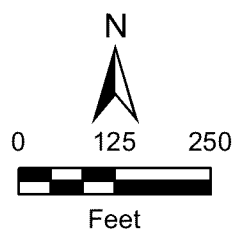
Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



Legend

- Concrete/sub-slab soil sample location
- ▭ Building location
- ▭ South pond location



Des Moines TCE Site
Des Moines, Iowa

Figure 5
Boring and Concrete
Sample Location Map

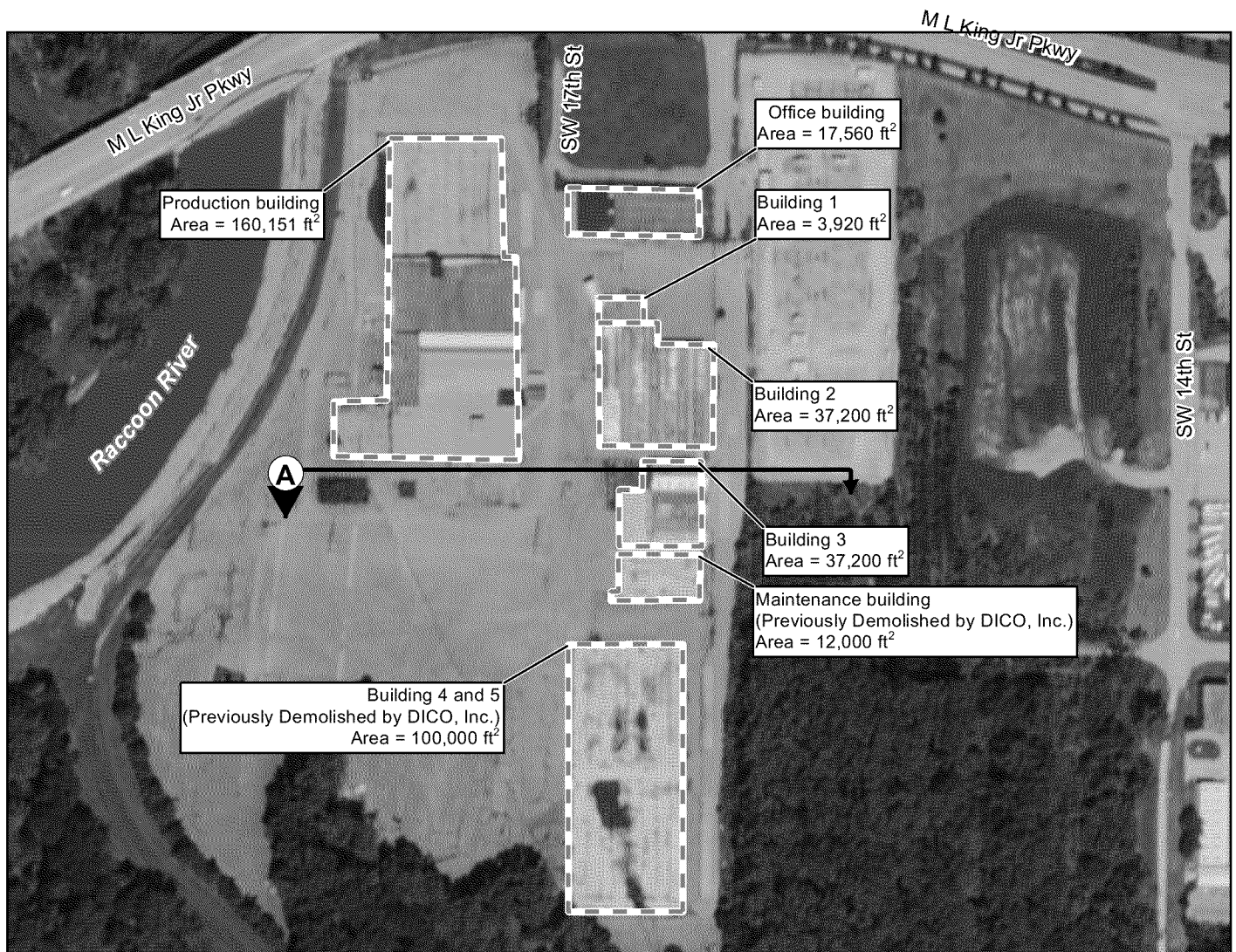


Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

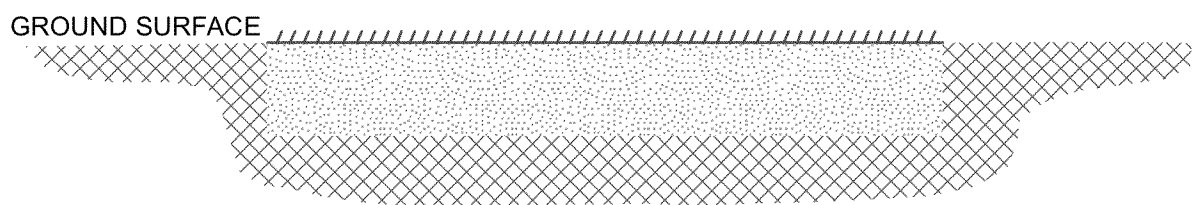
Date: 9/29/2016

Drawn By: Nick Wiederholt

Project No: X9025.16.0144.000



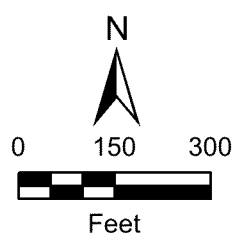
SECTION A: BUILDING DEMOLITION AND DISPOSAL



SECTION A
NOT TO SCALE

Legend

- Clean fill / top soil
- Native soil
- Vegetative cover
- Footprint of building demolitoin
- ft² Square feet



Des Moines TCE Site
Des Moines, Iowa

Figure 6
Alternative 2 - Building Demolition and
Disposal Cross-Section

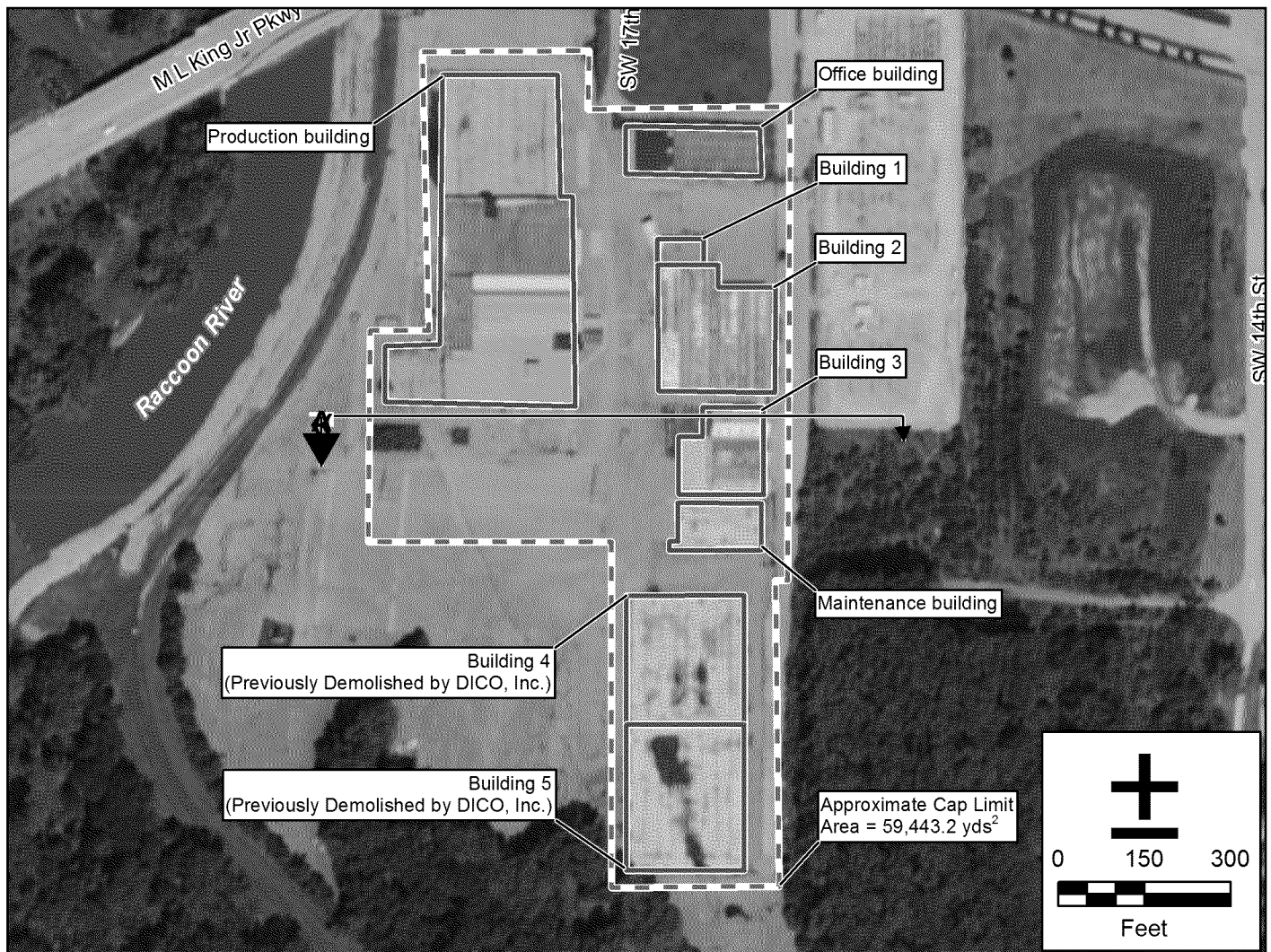


Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

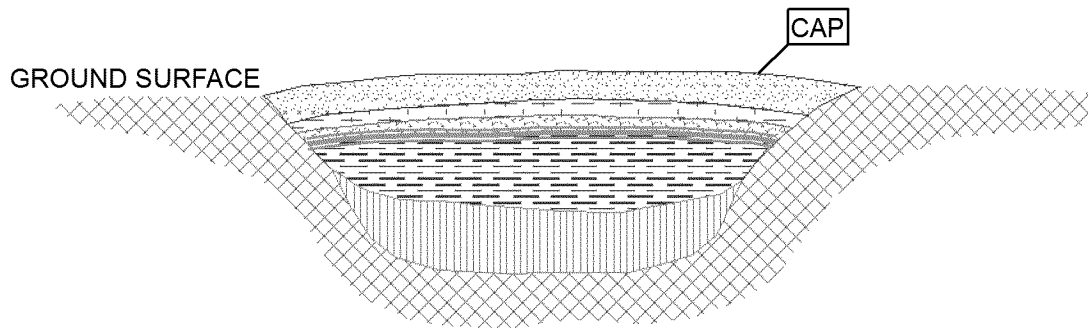
Date: 12/8/2016

Drawn By: Colin Willis

Project No: X9025.16.0144.000



SECTION A: BUILDING DEMOLITION AND CAPPING



SECTION A
NOT TO SCALE

Legend

- | | |
|--|------------------------------|
| HDPE Geomembrane | 6" protection layer |
| 3" asphalt layer | Approximate limits of cap |
| 24" compact clay layer | Footprint of building |
| Geocomposite drainage layer | yd ² Square yards |
| 36" Foundation layer (building debris) | |
| Native soil | |

Source: ESRI, ArcGIS Online Maps, World Imagery, 2014; HSIP Gold, 2007

Des Moines TCE Site
Des Moines, Iowa

Figure 7
Alternative 3 - Building Demolition and
Capping Cross-Section



Date: 12/9/2016

Drawn By: Colin Willis

Project No: X9025.16.0144.000

BUILDING SAMPLE RESULT TABLES

TABLE BUILDING 1

WIPE SAMPLE ANALYTICAL DATA SUMMARY - PESTICIDES PCBs

Boring		WS-01		WS-02		WS-03		WS-04		WS-05		WS-06		WS-07		WS-08		WS-09		WS-10		WS-11		WS-12		WS-13	
Sample		Building 3 - Southwest Brick Wall		Building 3 - Southeast Corner Steel I-Beam		Building 3 - North Central Concrete Floor		Building 3 - East Side Sheet Metal Surface		Building 2 - East Side Concrete Floor		Building 2 - North Side Brick Wall		Building 2 - Center Metal I-Beam		Building 2 - Southwest Wall Surface Coating		Building 1 - Center Concrete Floor		Building 1 - West Brick Wall		Building 1 - North Wall Metal Sheetting		Building 1 - Center Metal Box Surface		Production Building - North Central Concrete	
Chemical	Units	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
ALDRIN	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA ENDOSULFAN	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA-CHLORDANE	µg/cm ²	< 0.00050	U	< 0.00050	U	0.00095		< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	0.0028		< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	0.00054		< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
BETA ENDOSULFAN	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0011		< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
Chlordane; Gamma-	µg/cm ²	< 0.00050	U	< 0.00050	U	0.0013		< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	0.0056		0.00051		< 0.00050	U	< 0.00050	U	0.00054	J
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
DIELDRIN	µg/cm ²	< 0.0010	U	< 0.0010	U	0.0013		< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0032		< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0019	J
ENDOSULFAN SULFATE	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDRIN	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDRIN ALDEHYDE	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0015	J
ENDRIN KETONE	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0012	J
GAMMA BHC (LINDANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
HEPTACHLOR	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
HEPTACHLOR EPOXIDE	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	0.00079		< 0.00050	U	< 0.00050	U	< 0.00050	U	0.00063		0.00071		< 0.00050	U
METHOXYCHLOR	µg/cm ²	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U
P,P'-DDD	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
P,P'-DDE	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0020		< 0.0010	U	< 0.0010	U	< 0.0010	U	0.12		0.0061		0.0036		0.0051		0.0017	J
P,P'-DDT	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0025		< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0048		< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
PCB-1016 (AROCLOR 1016)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1221 (AROCLOR 1221)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1232 (AROCLOR 1232)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1242 (AROCLOR 1242)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1248 (AROCLOR 1248)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1254 (AROCLOR 1254)	µg/cm ²	< 0.010	U	< 0.010	U	0.023		< 0.010	U	0.015		< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	0.013		0.018		< 0.010	U
PCB-1260 (AROCLOR 1260)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
TOXAPHENE	µg/cm ²	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U

TABLE BUILDING 1 (Continued)

WIPE SAMPLE ANALYTICAL DATA SUMMARY - PESTICIDES PCBs

Boring		WS-13		WS-14		WS-15		WS-16		WS-17		WS-18		WS-19		WS-19		WS-20		WS-21		WS-22		WS-22	
Sample		Production Building - North Central Concrete		Center of Building Concrete		Production Building - South Central Concrete		Production Building - Central Easter I-Beam		Production Building - Central I-Beam		Production Building - NW Corner I-Beam		Production Building - SE Corner Sheet Metal		Production Building - SE Corner Sheet Metal		Production Building - NW Corner Sheet Metal		Production Building - Central Eastern Brick		Production Building - SW Corner Brick		Production Building - SW Corner Brick	
Chemical	Units	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
ALDRIN	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA ENDOSULFAN	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
ALPHA-CHLORDANE	µg/cm ²	0.00075	J	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
BETA ENDOSULFAN	µg/cm ²	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
Chlordane; Gamma-	µg/cm ²	0.00083	J	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
DIELDRIN	µg/cm ²	0.0028	J	< 0.0010	U	0.0039	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDOSULFAN SULFATE	µg/cm ²	0.0012	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDRIN	µg/cm ²	0.0013	J	0.0025	J	0.0062	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDRIN ALDEHYDE	µg/cm ²	0.0018	J	0.0023	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
ENDRIN KETONE	µg/cm ²	0.0016	J	0.0026	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
GAMMA BHC (LINDANE)	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
HEPTACHLOR	µg/cm ²	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
HEPTACHLOR EPOXIDE	µg/cm ²	0.00070		0.00052	J	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U	< 0.00050	U
METHOXYCHLOR	µg/cm ²	0.0064	J	< 0.0050	U	0.040	J	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U	< 0.0050	U
P,P'-DDD	µg/cm ²	< 0.0010	U	< 0.0010	U	0.0027	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
P,P'-DDE	µg/cm ²	0.0026	J	0.0047	J	0.0027	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U
P,P'-DDT	µg/cm ²	0.0012	J	0.0063	J	0.0028	J	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	< 0.0010	U	0.0035		0.0028	
PCB-1016 (AROCLOR 1016)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1221 (AROCLOR 1221)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1232 (AROCLOR 1232)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1242 (AROCLOR 1242)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1248 (AROCLOR 1248)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
PCB-1254 (AROCLOR 1254)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	0.016	J	< 0.010	U	< 0.010	U	0.012		< 0.010	U	< 0.010	U	< 0.010	U
PCB-1260 (AROCLOR 1260)	µg/cm ²	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U	< 0.010	U
TOXAPHENE	µg/cm ²	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U	< 0.050	U

Notes:

µg/cm² Micrograms per centimeter squared
U Non-detect
J Estimated

TABLE BUILDING 2																																																	
BUILDING MATERIAL SAMPLES ANALYTICAL DATA SUMMARY - PESTICIDES PCBs																																																	
Boring	BMS-01		BMS-02		BMS-03		BMS-04		BMS-05		BMS-06		BMS-07		BMS-08		BMS-09		BMS-10		BMS-11		BMS-12		BMS-13		BMS-14		BMS-15		BMS-16		BMS-17		BMS-18		BMS-19		BMS-20		BMS-21		BMS-22		BMS-23		BMS-24		
Sample	Building 3 - Center East Brick Wall	Building 3 - Center South Insulation Wall	Building 3 - SW Corner Cinder Block	Building 3 - Center East Wall Coating	Building 2 - Center East Brick Wall	Building 2 - Center South Wall Insulation	Building 2 - Center North Wall Cinder Block	Building 2 - Center Coating	Building 2 - North Room Dry Wall	Building 2 - South Brick Wall	Building 1 - Center of Building Insulation	Building 1 - East Wall Dry Wall	Building 1 - West Wall Coating	Production Building - NW Corner Brick	Production Building - NW Corner Brick	Production Building - West Wall Cinder Block	Production Building - North Wall Insulation	Production Building - Center of North Dry Wall	Production Building - Center of North Insulation	Production Building - Center of Building Brick	Production Building - Center of Building Coating	Production Building - Wall Insulation	Production Building - Center of Building Wood Wall	Production Building - Southeastern Wood Building																									
SAMPLE_TYPE_CODE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
Chemical	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
ALDRIN	µg/cm²	< 1.7	U	17	< 17000	U	750	< 17	U	9.0	63	710	320	< 1.7	U	< 6.2	U	< 1.7	U	200	< 1.7	U	14	J	< 1.7	U	9.6	< 2.0	U	< 5.2	U	< 1.7	U	440	6.8	J	4.1	J	< 2.0	UJ									
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	< 8.7	U	< 17000	U	< 50	U	< 17	U	< 5.1	U	< 1.7	U	< 51	U	< 2.0	U	< 1.7	U	< 6.2	U	< 1.7	U	< 52	U	< 1.7	U	< 1.7	U	< 1.7	U	< 5.2	U	< 2.0	U	< 5.2	U	< 1.7	U	< 49	U	< 4.9	U	3.0	J	< 2.0	U
ALPHA ENDOSULFAN	µg/cm²	< 1.7	U	< 8.7	U	< 17000	U	< 50	U	< 17	U	7.8	5.9	150	14	< 1.7	U	9.2	< 1.7	U	270	J	< 1.7	U	6.5	J	2.1	< 5.2	U	< 2.0	U	< 5.2	U	< 1.7	U	400	29	J	< 1.8	U	< 2.0	U							
ALPHA-CHLORDANE	µg/cm²	4.9		88		780000		2500		680		26	26	180	99	8.8	11	< 1.7	U	1500	< 1.7	U	21	J	6.6	12	7.5		7.4	< 1.7	U	< 49	U	< 4.9	U	< 1.8	UJ	12											
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	< 8.7	U	< 17000	U	130	< 17	U	9.4	< 1.7	U	160	19	< 1.7	U	6.2	3.0	93	< 1.7	U	20	J	4.4	J	< 5.2	U	< 2.0	U	7.6	5.9		230	J	35	J	9.8	J	5.1	J								
BETA ENDOSULFAN	µg/cm²	< 3.4	U	64	< 33000	U	540	< 33	U	13	< 3.4	U	110	12	< 3.3	U	< 12	U	< 3.3	U	350	J	< 3.3	U	11	J	< 3.3	U	< 10	U	< 3.9	U	< 10	U	< 3.3	U	180	J	37	J	17	J	7.4	J					
Chlordane; Gamma-	µg/cm²	7.6		73	860000		3600	750	60	60	530	190	11	25	7.5	1800	< 1.7	U	20	J	6.8	J	12		7.0		12		< 1.7	U	710	J	< 4.9	UJ	< 1.8	UJ	11	J											
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	8.7	< 17000	U	< 50	U	< 17	U	< 5.1	U	< 1.7	U	< 51	U	< 2.0	U	< 1.7	U	< 6.2	U	< 1.7	U	< 52	U	< 1.7	U	< 1.7	U	< 5.2	U	< 2.0	U	< 5.2	U	< 1.7	U	< 49	U	13	J	4.2	J	< 2.0	U			
DIELDRIN	µg/cm²	12		110	150000		6700	150	99	140	1600	710	18	49	15	1600	J	< 3.3	U	28	J	9.3	24	< 3.9	U	35	< 3.3	U	890	J	48	J	9.8	J	10	J													
ENDOSULFAN SULFATE	µg/cm²	< 3.4	U	68	< 33000	U	220	< 33	U	< 10	U	< 3.4	U	< 100	U	< 3.9	U	< 3.3	U	38	< 3.3	U	< 100	U	< 3.3	U	16	J	14	J	< 10	U	< 3.9	U	< 10	U	< 3.3	U	< 95	U	76	J	150	< 3.9	U				
ENDRIN	µg/cm²	< 3.4	U	< 17	U	< 33000	U	400	< 33	U	24	5.9	260	28	6.1	< 12	U	8.7	490	J	< 3.3	U	20	J	4.1	< 10	U	< 3.9	U	13	3.9	220	190	J	< 3.6	U	31	J											
ENDRIN ALDEHYDE	µg/cm²	< 3.4	U	< 17	U	< 33000	U	350	< 33	U	14	< 3.4	U	130	25	< 3.3	U	< 12	U	< 3.3	U	440	J	< 3.3	U	22	J	28	J	< 10	U	< 3.9	U	13	< 3.3	U	22000	J	160	J	120	17	J						
ENDRIN KETONE	µg/cm²	< 3.4	U	21	< 33000	U	480	< 33	U	< 10	U	5.2	240	35	< 3.3	U	< 12	U	< 3.3	U	260	5.1	< 3.3	U	61	< 10	U	< 3.9	U	11	< 3.3	U	< 95	U	340	J	< 3.6	U	6.7	J									
GAMMA BHC (LINDANE)	µg/cm²	< 1.7	U	< 8.7	U	< 17000	U	62	< 17	U	< 5.1	U	< 1.7	U	< 51	U	6.4	< 1.7	U	< 6.2	U	< 1.7	U	< 52	U	< 1.7	U	< 1.7	U	< 5.2	U	< 2.0	U	< 5.2	U	< 1.7	U	< 49	U	11	J	16	J	< 2.0	UJ				
HEPTACHLOR	µg/cm²	< 1.7	U	< 8.7	U	54000	340	46	6.3	11	170	100	< 1.7	U	< 6.2	U	< 1.7	U	280	J	< 1.7	U	6.0	J	< 1.7	U	< 5.2	U	< 2.0	U	< 5.2	U	< 1.7	U	< 49	U	< 4.9	U	< 1.8	U	< 2.0	U							
HEPTACHLOR EPOXIDE	µg/cm²	< 1.7	U	30	24000	180	< 17	U	18	20	210	22	< 1.7	U	35	4.8	390	< 1.7	U	< 1.7	U	< 1.7	U	7.6	< 2.0	U	13	< 1.7	U	390	J	12	J	4.6	J	8.9	J												
METHOXYCHLOR	µg/cm²	< 17	U	< 87	U	< 170000	U	1300	< 170	U	< 51	U	< 17	U	< 510	U	< 20	U	< 17	U	< 62	U	< 17	U	< 520	UJ	< 17	U	35	J	< 17	U	< 52	U	< 20	U	< 52	U	< 17	U	< 490	U	580	J	120	J	< 20	U	
P,P'-DDD	µg/cm²	< 3.4	U	< 17	U	< 33000	U	290	< 33	U	< 10	U	< 3.4	U	< 100	U	17	< 3.3	U	14	3.4	890	J	< 3.3	U	< 3.3	U	< 3.3	U	< 10	U	< 3.9	U	< 10	U	< 3.3	U	230	J	< 9.6	U	47	J	< 3.9	U				
P,P'-DDE	µg/cm²	< 3.4	U	21	35000	1100	< 33	U	40	37	1300	99	16	230	41	6900	< 3.3	U	13	J	5.0	10	< 3.9	U	< 10	U	< 3.3	U	420	89	J	41	J	19	J														
P,P'-DDT	µg/cm²	3.5	45	< 33000	U	260	< 33	U	22	21	970	39	11	72	14	6800	< 3.3	U	16	J	3.8	J	< 10	U	< 3.9	U	< 10	U	< 3.3	U	1500	J	100	J	110	96	J												
PCB-1016 (AROCLOR 1016)	µg/cm²	< 34	UJ	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	< 33	U	< 33	U	< 100	U	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U		
PCB-1221 (AROCLOR 1221)	µg/cm²	< 34	U	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	< 33	U	< 33	U	< 100	U	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U		
PCB-1232 (AROCLOR 1232)	µg/cm²	< 34	U	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	< 33	U	< 33	U	< 100	U	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U		
PCB-1242 (AROCLOR 1242)	µg/cm²	< 34	U	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	< 33	U	< 33	U	< 100	U	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U		
PCB-1248 (AROCLOR 1248)	µg/cm²	< 34	U	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	< 33	U	< 33	U	< 100	U	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U		
PCB-1254 (AROCLOR 1254)	µg/cm²	67	2700	< 33000	U	58000	< 33	U	3200	1500	25000	4600	< 33	U	1600	270	< 1000	U	< 33	U	< 33	U	< 33	U	620	< 39	U	1500	220	< 950	U	< 96	U	< 36	U	< 39	U												
PCB-1260 (AROCLOR 1260)	µg/cm²	< 34	UJ	< 170	U	< 33000	U	< 970	U	< 33	U	< 100	U	< 34	U	< 1000	U	< 39	U	< 33	U	< 120	U	< 33	U	< 1000	U	120	< 33	U	850	< 100	< 39	U	< 100	U	< 33	U	< 950	U	< 96	U	< 36	U	< 39	U			
PCB-1262 (AROCHLOR 1262)	µg/cm²	< 34	U	< 170	U	< 330																																											

TABLE BUILDING 3																																					
CONCRETE SAMPLES ANALYTICAL DATA SUMMARY - PESTICIDES PCBs																																					
Boring		SB-01		SB-02		SB-03		SB-04		SB-05		SB-06		SB-07		SB-08		SB-09		SB-10		SB-10		SB-11		SB-12		SB-13		SB-14		SB-15		SB-16		SB-17	
Sample		South bldg. 5 - SB-01 Concrete		North bldg. 5 - SB-02 Concrete		South bldg. 4 - SB-03 Concrete		North bldg. 4 - SB-04 Concrete		West maintenance bldg. - SB-05 Concrete		East maintenance bldg. - SB-06 Concrete		South bldg. 3 - SB-07 Concrete		North bldg. 3 - SB-08 Concrete		East bldg. 2 - SB-09 Concrete		West bldg. 2 - SB-10 Concrete		West Bldg. 2 - SB-10 Concrete		North bldg. 2 - SB-11 Concrete		North Bldg 1 - SB-12 Concrete		South bldg. 1 - SB-13 Concrete		Production Building - SB-14 Concrete		Production Building - SB-15 Concrete		Production Building - SB-16 Concrete		Production Building - SB-17 Concrete	
Chemical	Units	Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result		Result	
ALDRIN	µg/cm²	130	J	850		510		540		640		420		840		16000		1600		160		67		1000		< 34	U	55		150		41		7.6		400	
ALPHA BHC (ALPHA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	< 1.7	U	< 1.7	U	< 17	U	< 34	U	< 8.5	U	< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
ALPHA ENDOSULFAN	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	1.8		< 1.7	U	< 17	U	< 34	U	< 8.5	U	< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
ALPHA-CHLORDANE	µg/cm²	< 1.7	U	110		54		< 17	U	< 17	U	240		89		< 340	U	40		16		< 1.7	U	44		< 34	U	46		< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
BETA BHC (BETA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	< 1.7	U	< 1.7	U	< 17	U	< 34	U	< 8.5	U	< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
BETA ENDOSULFAN	µg/cm²	< 3.3	U	< 33	U	< 33	U	< 33	U	< 32	U	< 16	U	< 33	U	< 660	U	< 33	U	3.5		< 3.3	U	< 32	U	< 65	U	< 16	U	< 3.3	U	33		3.6		< 16	U
Chlordane; Gamma-	µg/cm²	110		670		250		65		41		400		120		550		220		57		22		130		150		53		< 1.7	UJ	28		< 1.7	U	9.1	
DELTA BHC (DELTA HEXACHLOROCYCLOHEXANE)	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	< 1.7	U	< 1.7	U	< 17	U	< 34	U	< 8.5	U	< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
DIELDRIN	µg/cm²	24	J	140		120		74		97		280		210		1700		670		57		31		430		110		130		51	J	37		22		59	
ENDOSULFAN SULFATE	µg/cm²	4.4	J	< 33	U	< 33	U	< 33	U	< 32	U	< 16	U	< 33	U	< 660	U	< 33	U	3.6		< 3.3	U	< 32	U	< 65	U	< 16	U	< 3.3	U	< 33	U	< 3.3	U	< 16	U
ENDRIN	µg/cm²	< 3.3	U	< 33	U	< 33	U	< 33	U	< 32	U	25		< 33	U	< 660	U	1200		9.0		5.2		< 32	U	< 65	U	< 16	U	33	J	34		3.3		< 16	U
ENDRIN ALDEHYDE	µg/cm²	< 3.3	U	< 33	U	< 33	U	< 33	U	< 32	U	< 16	U	< 33	U	< 660	U	< 33	U	4.3		< 3.3	U	< 32	U	< 65	U	23		< 3.3	U	41		9.5		< 16	U
ENDRIN KETONE	µg/cm²	3.9	J	< 33	U	< 33	U	< 33	U	< 32	U	< 16	U	< 33	U	< 660	U	< 33	U	< 3.3	U	< 3.3	U	< 32	U	< 65	U	< 16	U	< 3.3	U	34		3.9		< 16	U
GAMMA BHC (LINDANE)	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	7.9		< 1.7	U	< 17	U	< 34	U	< 8.5	U	< 1.7	U	< 17	U	< 1.7	U	< 8.5	U
HEPTACHLOR	µg/cm²	< 1.7	U	< 17	U	< 17	U	< 17	U	< 17	U	< 8.5	U	< 17	U	< 340	U	< 17	U	2.8		< 1.7	U	34		< 34	U	< 8.5	U	2.1	J	< 17	U	< 1.7	U	< 8.5	U
HEPTACHLOR EPOXIDE	µg/cm²	4.5		< 17	U	< 17	U	< 17	U	< 17	U	21		< 17	U	< 340	U	< 17	U	6.9		4.1		25		< 34	U	< 8.5	U	6.2	J	< 17	U	7.7		< 8.5	U
METHOXYCHLOR	µg/cm²	< 17	U	< 170	U	< 170	U	< 170	U	< 170	U	< 85	U	290		< 3400	U	< 170	U	26		< 17	U	< 170	U	< 340	U	< 85	U	560	J	< 170	U	< 17	U	< 85	U
P,P'-DDD	µg/cm²	< 3.3	U	< 33	U	< 33	U	< 33	U	< 32	U	< 16	U	< 33	U	< 660	U	< 33	U	< 3.3	U	< 3.3	U	< 32	U	< 65	U	< 16	U	64		< 33	U	4.2		< 16	U
P,P'-DDE	µg/cm²	8.0	J	< 33	U	< 33	U	< 33	U	< 32	U	41		140		< 660	U	190		47		25		280		10000		930		90		1100		61		38	
P,P'-DDT	µg/cm²	< 3.3	U	41		47		< 33	U	< 32	U	19		42	J	< 660	U	< 33	U	5.7		< 3.3	U	40		73		97		45		61		< 3.3	U	20	
PCB-1016 (AROCLOR 1016)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	UJ	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1221 (AROCLOR 1221)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1232 (AROCLOR 1232)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1242 (AROCLOR 1242)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1248 (AROCLOR 1248)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1254 (AROCLOR 1254)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1260 (AROCLOR 1260)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
PCB-1262 (AROCHLOR 1262)	µg/cm²	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	U	< 32	U	< 33	U	< 33	U	< 33	U	< 33	U	< 33	UJ	< 33	U
TOXAPHENE	µg/cm²	< 170	U	< 1700	U	< 1700	U	< 1700	U	< 1700	U	< 850	U	< 1700	U	< 34000	U	< 1700	U	< 170	U	< 170	U	< 1700	U	< 3400	U	< 850	U	< 170	U	< 1700	U	< 170	U	< 850	U

Notes:

µg/cm² Micro-grams per centimeter squared
U Non-detect
J Estimated

APPENDIX A
COST ESTIMATE

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

TABLE A-1						
COST SUMMARY						
Alternative	Option	Description	Capital Cost	Institutional Controls	Operation & Maintenance	Total
1E-05 RISK						
2	NA	Building Demolition and Off-site Disposal	\$ 28,243,000	\$ 55,000	\$ 181,000	\$ 28,479,000
3	NA	Building Demolition and Capping	\$ 24,824,000	\$ 55,000	\$ 1,508,000	\$ 26,387,000

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

**ALTERNATIVE 2
BUILDING DEMOLITION AND OFF-SITE DISPOSAL**

Table A-2					
Alternative 2 - Building Demolition and Off-site Disposal					
Source	Description	Subtotal		Contingency	Total (Rounded)
Table A-3	Design and Construction	\$ 21,725,743		\$ 6,517,722.89	\$ 28,243,000
Table A-4	Institutional Controls	\$ 42,500		\$ 12,750	\$ 55,000
Table A-5	Operation and Maintenance	\$ 139,199		\$ 41,759.66	\$ 181,000
Contingency		30%		\$ 6,572,232.55	
Total					\$ 28,479,000

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Capital Cost

Location factor (for zip code 433xx)

ECHOS

1

Get-a-Quote

1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General

25%

Typical general contractor overhead and profit

Means

-

NA

RACER

25%

NA

Contractor quote

5%

Prime contractor markup

Professional judgment

-

Not marked-up

Inflation

2.08%

Avg. annual inflation from 2010 to 2015

Table A-3						
Alternative 2 - Building Demolition and Off-site Disposal						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal					\$ 14,983,271
	Site Preparation					\$ 15,000
1	Temporary facilities	1.0	ls	\$ 15,000.00	\$ 15,000.00	\$ 15,000
	Asbestos Survey					\$ 8,703
1	Asbestos survey	1.0	ls	\$ 6,962.00	\$ 8,702.50	\$ 8,703
	Equipment Decontamination					\$ 81,685
2	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 55,716.00	\$ 69,645.00	\$ 69,645
3	Transportation and disposal (55 gallon drums of wastewater)	50.0	ea	\$ 192.64	\$ 240.80	\$ 12,040
	Asbestos Removal and Disposal					\$ 603,711
4	Asbestos removal - Office Building	1.0	ls	\$ 69,387.00	\$ 86,733.75	\$ 86,734
5	Asbestos removal - Production Building	1.0	ls	\$ 136,063.00	\$ 170,078.75	\$ 170,079
6	Asbestos removal - Building 1	1.0	ls	\$ 34,839.00	\$ 43,548.75	\$ 43,549
7	Asbestos removal - Building 2	1.0	ls	\$ 167,459.00	\$ 209,323.75	\$ 209,324
8	Asbestos removal - Building 3	1.0	ls	\$ 75,220.00	\$ 94,025.00	\$ 94,025
	Building Demolition					\$ 785,685
9	Building demolition - Office Building	1.0	ls	\$ 61,100.67	\$ 76,375.84	\$ 76,376
10	Building demolition - Production Building	1.0	ls	\$ 403,633.44	\$ 504,541.80	\$ 504,542
11	Building demolition - Building 1	1.0	ls	\$ 11,591.29	\$ 14,489.11	\$ 14,489
12	Building demolition - Building 2	1.0	ls	\$ 109,998.95	\$ 137,498.69	\$ 137,499
13	Building demolition - Building 3	1.0	ls	\$ 41,110.33	\$ 51,387.91	\$ 51,388

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

14	Building demolition - Walkway	1.0	ls	\$ 1,112.76	\$ 1,390.95	\$ 1,391
	Slab Demolition					\$ 529,227
15	Slab demolition - Office Building	1.0	ls	\$ 21,191.33	\$ 26,489.16	\$ 26,489
16	Slab demolition - Production Building	1.0	ls	\$ 193,269.32	\$ 241,586.65	\$ 241,587
17	Slab demolition - Building 1	1.0	ls	\$ 4,731.12	\$ 5,913.90	\$ 5,914
18	Slab demolition - Building 2	1.0	ls	\$ 44,892.89	\$ 56,116.11	\$ 56,116
19	Slab demolition - Building 3	1.0	ls	\$ 24,135.57	\$ 30,169.46	\$ 30,169
20	Slab demolition - Maintenance Building	1.0	ls	\$ 14,481.73	\$ 18,102.16	\$ 18,102
21	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 120,679.81	\$ 150,849.76	\$ 150,850

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Table A-3						
Alternative 2 - Building Demolition and Off-site Disposal						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Transportation and Disposal					\$ 12,536,417
22	Dump charges (non-hazardous waste)	7,069.0	cy	\$ 15.00	\$ 18.75	\$ 132,544
23	Wheel loader, 1.25 CY (non-hazardous waste)	73.0	hr	\$ 101.36	\$ 126.70	\$ 9,249
24	Dump truck, 8 CY (non-hazardous waste)	516.0	hr	\$ 111.76	\$ 139.70	\$ 72,085
25	Transportation and disposal (hazardous)	45,207.0	ton	\$ 265.00	\$ 272.58	\$ 12,322,539
	Earthwork					\$ 321,705
26	Unclassified fill, 6 inch lifts, off-site (includes delivery, spreading, and compaction)	192.6	cy	\$ 27.91	\$ 34.89	\$ 6,719
27	Loam or topsoil, imported, 6 inches deep, furnish and place	4,338.7	lcy	\$ 40.80	\$ 51.00	\$ 221,271
28	Geotextile fabric, non-woven 80 mil	39,047.9	sy	\$ 1.92	\$ 2.40	\$ 93,715
	Measurement					\$ 61,446
29	Pre-construction surveying	14.0	days	\$ 1,620.00	\$ 2,194.52	\$ 30,723
30	Post-construction surveying	14.0	days	\$ 1,620.00	\$ 2,194.52	\$ 30,723
	Site Restoration					\$ 39,692
31	Seeding, vegetative cover	8.1	ac	\$ 3,934.78	\$ 4,918.48	\$ 39,692
Construction subtotal						\$ 14,983,271
Construction Contractor Mobe/Demobe, Site Prep and Submittals						\$ 1,498,327.10
Pre-design investigation						\$ 1,498,327.10
Engineering design						\$ 2,696,988.78
Project management and construction oversight						\$ 1,048,828.97
Capital Cost Subtotal						\$ 21,725,743

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Table A-4						
Institutional Controls						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Institutional Controls Subtotal					\$ 42,500
32	Prepare LUC Implementation Plan (mid-level staff with senior review)	250	hr	\$ 110.00	\$ 110.00	\$ 27,500
33	Meetings with agencies (senior staff and attorneys)	60	hr	\$ 250.00	\$ 250.00	\$ 15,000

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Operation and Maintenance

Table A-5						
Operation and Maintenance						
Item	Description				Quantity	Unit
					Unit Price	Unit Price (Incl. O&P)
					Total Cost	
	Annual Operation and Maintenance Subtotal					\$ 29,105
	Groundwater Monitoring					\$ 29,105
34	Groundwater sampling (2 person crew; w/ travel and materials)				2.0	day
35	Sample analysis (VOCs and pesticides)				20.0	ea
36	Monitoring annual report				1.0	ls
37	Engineer site visit (1 per year)				1.0	ls
#REF!	Proj. Mgmt.	2 hrs/wk	on proj for	24 weeks	48.0	hr

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

**ALTERNATIVE 3
BUILDING DEMOLITION AND CAPPING**

Table A-6					
Alternative 3 - Building Demolition and Capping					
Source	Description	Subtotal		Contingency	Total (Rounded)
Table A-7	Design and Construction	\$ 19,095,231		\$ 5,728,569.38	\$ 24,824,000
Table A-8	Institutional Controls	\$ 42,500		\$ 12,750	\$ 55,000
Table A-9	Operation and Maintenance	\$ 1,159,634		\$ 347,890.31	\$ 1,508,000
Contingency		30%		\$ 6,089,209.68	
Total					\$ 26,387,000

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Capital Cost

Location factor (for zip code 433xx)

ECHOS

Get-a-Quote

1
1.04

Note: Location factor applied only to national average unit costs; not applied to local unit costs such as from vendors or Means.

Overhead and Profit (O&P)

General

Means

RACER

Contractor quote

Professional judgment

25%	Typical general contractor overhead and profit
-	NA
25%	NA
5%	Prime contractor markup
-	Not marked-up

Inflation

2.08%	Avg. annual inflation from 2010 to 2016
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Table A-7						
Alternative 3 - Building Demolition and Capping						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Construction Subtotal					\$ 13,169,125
	Site Preparation					\$ 15,000
1	Temporary facilities	1.0	ls	\$ 15,000.00	\$ 15,000.00	\$ 15,000
	Asbestos Survey					\$ 8,703
1	Asbestos survey	1.0	ls	\$ 6,962.00	\$ 8,702.50	\$ 8,703
	Equipment Decontamination					\$ 81,685
2	Decontamination facilities (1,500 square feet)	1.0	ls	\$ 55,716.00	\$ 69,645.00	\$ 69,645
3	Transportation and disposal (55 gallon drums of wastewater)	50.0	ea	\$ 192.64	\$ 240.80	\$ 12,040
	Asbestos Removal and Disposal					\$ 603,711
4	Asbestos removal - Office Building	1.0	ls	\$ 69,387.00	\$ 86,733.75	\$ 86,734
5	Asbestos removal - Production Building	1.0	ls	\$ 136,063.00	\$ 170,078.75	\$ 170,079
6	Asbestos removal - Building 1	1.0	ls	\$ 34,839.00	\$ 43,548.75	\$ 43,549
7	Asbestos removal - Building 2	1.0	ls	\$ 167,459.00	\$ 209,323.75	\$ 209,324
8	Asbestos removal - Building 3	1.0	ls	\$ 75,220.00	\$ 94,025.00	\$ 94,025
	Building Demolition					\$ 888,427
9	Building demolition - Office Building	1.0	ls	\$ 61,100.67	\$ 76,375.84	\$ 76,376
10	Building demolition - Production Building	1.0	ls	\$ 403,633.44	\$ 504,541.80	\$ 504,542
11	Building demolition - Building 1	1.0	ls	\$ 11,591.29	\$ 14,489.11	\$ 14,489
12	Building demolition - Building 2	1.0	ls	\$ 109,998.95	\$ 137,498.69	\$ 137,499

Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa

13	Building demolition - Building 3	1.0	ls	\$ 41,110.33	\$ 51,387.91	\$ 51,388
14	Building demolition - Walkway	1.0	ls	\$ 1,112.76	\$ 1,390.95	\$ 1,391
15	Crusher, including 950 and 953 loaders (200 tons/hour)	164.0	hr	\$ 501.18	\$ 626.48	\$ 102,742
	Slab Demolition					\$ 571,312
16	Slab demolition - Office Building	1.0	ls	\$ 21,191.33	\$ 26,489.16	\$ 26,489
17	Slab demolition - Production Building	1.0	ls	\$ 193,269.32	\$ 241,586.65	\$ 241,587
18	Slab demolition - Building 1	1.0	ls	\$ 4,731.12	\$ 5,913.90	\$ 5,914
19	Slab demolition - Building 2	1.0	ls	\$ 44,892.89	\$ 56,116.11	\$ 56,116
20	Slab demolition - Building 3	1.0	ls	\$ 24,135.57	\$ 30,169.46	\$ 30,169
21	Slab demolition - Maintenance Building	1.0	ls	\$ 14,481.73	\$ 18,102.16	\$ 18,102
22	Slab demolition - Buildings 4 and 5	1.0	ls	\$ 120,679.81	\$ 150,849.76	\$ 150,850
23	Concrete pulverizer crew	72.0	hr	\$ 467.61	\$ 584.51	\$ 42,085

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Table A-7						
Alternative 3 - Building Demolition and Capping						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Transportation and Disposal					\$ 4,082,995
24	Dump charges (non-hazardous waste)	856.0	cy	\$ 15.00	\$ 18.75	\$ 16,050
25	Wheel loader, 1.25 CY (non-hazardous waste)	19.0	hr	\$ 101.36	\$ 126.70	\$ 2,407
26	Dump truck, 8 CY (non-hazardous waste)	147.0	hr	\$ 111.76	\$ 139.70	\$ 20,536
27	Transportation and disposal (hazardous)	14,836.0	ton	\$ 265.00	\$ 272.58	\$ 4,044,002
	Capping					\$ 6,855,846
24	Unclassified fill, 6 inch lifts, on-site (includes spreading and compaction)	74,304.0	cy	\$ 6.52	\$ 8.15	\$ 605,577
25	Unclassified fill, 6 inch lifts, off-site (includes delivery, spreading, and compaction)	12,384.0	cy	\$ 27.91	\$ 34.89	\$ 432,046
26	Asphalt pavement - 6 inch base course layer, 3 inch topping	59,443.2	sy	\$ 37.28	\$ 46.60	\$ 2,770,052
27	Clay, low permeability, 6 inch lifts, off-site	55,480.3	cy	\$ 30.27	\$ 37.84	\$ 2,099,235
28	Drainage netting, geotextile fabric heat-bonded 2 sides	588,487.4	sf	\$ 0.68	\$ 0.85	\$ 500,214
29	40 mil polymeric liner, high-density polyethylene	588,487.4	sf	\$ 0.61	\$ 0.76	\$ 448,722
	Measurement					\$ 61,446
30	Pre-construction surveying (1 transect every 50 feet; 10 per day)	14.0	days	\$ 1,620.00	\$ 2,194.52	\$ 30,723
31	Post-construction surveying (1 transect every 50 feet; 10 per day)	14.0	days	\$ 1,620.00	\$ 2,194.52	\$ 30,723
Construction subtotal						\$ 13,169,125
Construction Contractor Move/Demove, Site Prep and Submittals						\$ 1,316,912.50
Pre-design investigation						\$ 1,316,912.50
Engineering design						\$ 2,370,442.50
Project management and construction oversight						\$ 921,838.75
Capital Cost Subtotal						\$ 19,095,231

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Table A-8						
Institutional Controls						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Institutional Controls Subtotal					\$ 42,500
32	Prepare LUC Implementation Plan (mid-level staff with senior review)	250	hr	\$ 110.00	\$ 110.00	\$ 27,500
33	Meetings with agencies (senior staff and attorneys)	60	hr	\$ 250.00	\$ 250.00	\$ 15,000

**Appendix A
Building Demolition
Des Moines TCE Site
Des Moines, Iowa**

Operation and Maintenance

Table A-9						
Operation and Maintenance						
Item	Description	Quantity	Unit	Unit Price	Unit Price (Incl. O&P)	Total Cost
	Annual Operation and Maintenance Subtotal					\$ 43,434
	Cap and Groundwater Monitoring					\$ 41,605
34	Cap material sampling and analysis (every 500 ft)	2.0	ea	\$ 2,000.00	\$ 2,000.00	\$ 4,000
35	Cap thickness verification (every 100 ft)	10.0	ea	\$ 150.00	\$ 150.00	\$ 1,500
36	Groundwater sampling (2 person crew; w/ travel and materials)	2.0	day	\$ 4,000.00	\$ 4,000.00	\$ 8,000
37	Groundwater sample analysis (VOCs and pesticides)	20.0	ea	\$ 243.79	\$ 330.25	\$ 6,605
38	Monitoring annual report	1.0	ls	\$ 5,000.00	\$ 5,000.00	\$ 5,000
39	Engineer site visit (1 per year)	1.0	ls	\$ 3,500.00	\$ 3,500.00	\$ 3,500
40	Proj. Mgmt. 2 hrs/wk on proj for 52 weeks	104.0	hr	\$ 125.00	\$ 125.00	\$ 13,000
	Cap Repair					\$ 1,829
41	Install new aggregate material	40.0	cy	\$ 33.00	\$ 45.72	\$ 1,829

APPENDIX B
RACER OUTPUT

TABLE B-1
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
ASBESTOS SURVEY

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Survey								
33010104	Sample collection, vehicle mileage charge, car or van	420	MI	0.00	0.00	0.00	0.51	214.20
33010202	Per Diem (per person)	6	DAY	0.00	0.00	0.00	144.00	864.00
33020603	Surface Soil Sampling Equipment	1	EA	491.09	0.00	0.00	0.00	491.09
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	100	EA	0.00	0.00	0.00	19.68	1,968.12
33220102	Project Manager	3	HR	0.00	91.12	0.00	0.00	273.37
33220108	Project Scientist	10	HR	0.00	75.99	0.00	0.00	759.90
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220112	Field Technician	48	HR	0.00	38.20	0.00	0.00	1,833.46
33220114	Word Processing/Clerical	2	HR	0.00	41.02	0.00	0.00	82.04
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
33240101	Other Direct Costs	1	LS	148.27	0.00	0.00	0.00	148.27
Asbestos Survey Subtotal (without makeup) =								\$6,962.37
Total Cost (without markup) =								\$6,962.37

Notes:

DAY	Day
EA	Each
HR	Hour
LS	Lump sum
MI	Mile
PLM	Professional labor management
QA	Quality assurance
QC	Quality control

TABLE B-2
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
EQUIPMENT DECONTAMINATION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Off-site Transportation and Waste Disposal								
33190103	Load Drums on Disposal Vehicle	50	EA	0.00	5.62	1.63	0.00	362.60
33190108	Tanker Pumping Equipment to Load Liquid	1	HR	0.00	0.00	0.00	26.69	26.69
33190204	Transport 55 Gallon Drums of Hazardous Waste, Max 80 drums (per Mile)	200	MI	0.00	0.00	0.00	2.57	514.80
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1	EA	0.00	0.00	0.00	49.50	49.50
33197217	Landfill Drummed Liquid Waste Requiring Stabilization, 55 Gallon Drum	50	EA	0.00	0.00	0.00	173.58	8,678.84
Off-site Transportation and Waste Disposal Subtotal (without markup) =								\$9,632.43
Decontamination Facilities								
17030109	Pad Subgrade Preparation	133.33	CY	0.00	5.77	1.51	0.00	971.44
17030257	Cat 215, 1.0 CY, Soil, Shallow, Trenching, Excludes Sheeting, Excludes Dewatering	2.49	BCY	0.00	0.77	0.30	0.00	2.68
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	133.33	ECY	0.00	2.60	0.14	0.00	364.68
17030510	Dry Roll Gravel, Steel Roller	200	SY	0.00	0.88	0.30	0.00	236.36
18010102	Gravel, Delivered & Dumped	55.56	CY	23.76	6.73	6.35	0.00	2,046.97
18010103	Gravel (90%) & Sand Base (10%), with Calcium Chloride 3/4 - 1 Lb/CY	55.56	CY	4.01	0.32	0.28	0.00	256.32
18010201	Concrete Curb, 6" x 6"	166	LF	3.58	1.55	0.00	0.00	852.63
18020203	26" x 26", 5' Deep Area Drain with Grate	1	EA	1,287.00	2,224.33	35.20	0.00	3,546.53
18020321	6" Structural Slab on Grade	1500	SF	3.56	2.85	0.08	0.00	9,727.44
19020313	5' x 5' x 5' Reinforced Concrete Sump	1	EA	1,462.32	2,954.42	55.12	0.00	4,471.86
19020604	12" x 12" CIP Concrete In-Ground Trench Drain with Metal Grate	28	LF	63.91	58.19	0.36	0.00	3,428.93
19040606	5,000 Gallon Steel Sump, Aboveground with Supports & Fittings, Excludes Foundation, Pumps, Piping	1	EA	18,909.00	818.03	0.00	0.00	19,727.03
33080503	Polymeric Liner Anchor Trench, 3' x 1.5'	199.2	LF	0.19	2.19	0.34	0.00	543.09
33080532	Geotextile Fabric, Non-Woven 80 Mil	200	SY	0.97	0.92	0.03	0.00	382.81
33080571	40 Mil Polymeric Liner, High-density Polyethylene	1800	SF	0.35	0.24	0.02	0.00	1,087.23
33170818	Spray washers, cold water, electric, 1800 psi, 5 GPM, 5 HP, rent/month	1	MO	0.00	0.00	0.00	684.09	684.09
33170823	Operation of Pressure Washer, Including Water, Soap, Electricity, Labor	10	HR	0.00	74.33	0.00	0.00	743.34
33231306	High Sump Level Switch for Avoiding Overflow	1	EA	154.50	0.00	0.00	0.00	154.50
33260623	(2 1/2", 4") PVC Double-wall Piping, with Fittings	30	LF	45.46	34.76	0.00	0.00	2,406.57
33290401	Pump, pedestal sump, single stage, 25 GPM, 1 H.P., 1-1/2" discharge	1	EA	3,415.50	665.63	0.00	0.00	4,081.13
Decontamination Facilities Subtotal (without markup) =								\$55,715.63
Total Cost (without markup) =								\$65,348.06

TABLE B-2
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
EQUIPMENT DECONTAMINATION

Notes:

BCY	Bank cubic yard
CY	Cubic yard
EA	Each
ECY	Embankment cubic yard
GPM	Gallons per minute
HP	Horsepower
HR	Hour
lb	Pound
LF	Linear foot
LS	Lump sum
MI	Mile
MO	Month
PVC	Polyvinyl choride
SF	Square foot
SY	Square yard

TABLE B-3
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
OFFICE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	144000	CF	0.00	0.17	0.08	0.00	35,483.53
17020401	Dump Charges	3687	EA	15.00	0.00	0.00	0.00	55,305.00
17030224	966, 4.0 CY, Wheel Loader	19	HR	0.00	70.55	71.79	0.00	2,704.53
17030288	26 CY, Semi Dump	195	HR	0.00	65.67	63.60	0.00	25,206.81
								118,699.88
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	98560	CF	0.00	0.17	0.08	0.00	24,286.51
17020401	Dump Charges	2711	EA	15.00	0.00	0.00	0.00	40,665.00
17030222	926, 2.0 CY, Wheel Loader	40	HR	0.00	70.55	41.79	0.00	4,493.78
17030287	20 CY, Semi Dump	208	HR	0.00	65.67	54.92	0.00	25,081.99
								94,527.27
17020106	Single-level, Concrete, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	5400	CF	0.00	0.17	0.08	0.00	1,330.63
17020401	Dump Charges	149	EA	15.00	0.00	0.00	0.00	2,235.00
17030220	910, 1.25 CY, Wheel Loader	3	HR	0.00	70.55	30.81	0.00	304.10
17030284	8 CY, Dump Truck	25	HR	0.00	65.67	46.09	0.00	2,793.83
								6,663.57
Building Demolition Subtotal (without markup) =								\$219,890.72
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	216.79	CY	0.00	75.00	22.75	0.00	21,191.33
17020401	Dump Charges	326	EA	15.00	0.00	0.00	0.00	4,890.00
17030220	910, 1.25 CY, Wheel Loader	7	HR	0.00	70.55	30.81	0.00	709.57
17030284	8 CY, Dump Truck	55	HR	0.00	65.67	46.09	0.00	6,146.44
Slab Demolition Subtotal (without markup) =								\$32,937.34
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	18160	SF	0.08	1.22	0.00	0.00	23,540.74
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	49	EA	8.81	0.00	0.00	0.00	431.74
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32

TABLE B-3
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
OFFICE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	1476	EA	0.00	1.19	0.00	0.00	1,763.29
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	274	EA	100.00	0.00	0.00	0.00	27,400.00
17030220	910, 1.25 CY, Wheel Loader	6	HR	0.00	70.55	30.81	0.00	608.21
17030284	8 CY, Dump Truck	46	HR	0.00	65.67	46.09	0.00	5,140.66
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	4	EA	23.02	0.00	0.00	0.00	92.07
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	4	EA	15.69	0.00	0.00	0.00	62.77
33020401	Disposable Materials per Sample	17	EA	10.34	0.00	0.00	0.00	175.83
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	12	HR	0.00	75.99	0.00	0.00	911.88
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	19	HR	0.00	79.81	0.00	0.00	1,516.36
33220112	Field Technician	3	HR	0.00	38.20	0.00	0.00	114.59
33220114	Word Processing/Clerical	3	HR	0.00	41.02	0.00	0.00	123.06
33220115	Draftsman/CADD	3	HR	0.00	43.99	0.00	0.00	131.96
Asbestos Removal Subtotal (without markup) =								\$69,387.08
Total Cost (without markup) =								\$542,105.86

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-4
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
PRODUCTION BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	29296	SF	0.08	1.22	0.00	0.00	37,976.30
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	29296	SF	0.05	0.18	0.00	0.00	6,876.27
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	6	EA	30.20	74.67	0.00	0.00	629.16
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	79	EA	8.81	0.00	0.00	0.00	696.07
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	29296	SF	0.05	0.71	0.00	0.00	22,461.23
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	2381	EA	0.00	1.19	0.00	0.00	2,844.44
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	441	EA	100.00	0.00	0.00	0.00	44,100.00
17030220	910, 1.25 CY, Wheel Loader	9	HR	0.00	70.55	30.81	0.00	912.31
17030284	8 CY, Dump Truck	74	HR	0.00	65.67	46.09	0.00	8,269.75
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	10	EA	23.02	0.00	0.00	0.00	230.18
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	10	EA	15.69	0.00	0.00	0.00	156.92
33020401	Disposable Materials per Sample	18	EA	10.34	0.00	0.00	0.00	186.17
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	13	HR	0.00	75.99	0.00	0.00	987.87
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	30	HR	0.00	79.81	0.00	0.00	2,394.25
33220112	Field Technician	4	HR	0.00	38.20	0.00	0.00	152.79
33220114	Word Processing/Clerical	4	HR	0.00	41.02	0.00	0.00	164.07
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
Asbestos Removal Subtotal (without markup) =								\$136,063.35
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	413952	CF	0.00	0.17	0.08	0.00	102,003.33
17020401	Dump Charges	6840	EA	0.00	0.00	0.00	265.00	1,812,600.24
								1,914,603.56

TABLE B-4
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
PRODUCTION BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	518448	CF	0.00	0.17	0.08	0.00	127,752.54
17020401	Dump Charges	8911	EA	0.00	0.00	0.00	265.00	2,361,415.31
								2,489,167.85
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	381720	CF	0.00	0.17	0.08	0.00	94,060.93
17020401	Dump Charges	6561	EA	0.00	0.00	0.00	265.00	1,738,665.23
								1,832,726.16
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	54168	CF	0.00	0.17	0.08	0.00	13,347.72
17020401	Dump Charges	932	EA	0.00	0.00	0.00	265.00	246,980.03
								260,327.75
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	344064	CF	0.00	0.13	0.06	0.00	66,468.91
17020401	Dump Charges	7290	EA	0.00	0.00	0.00	265.00	1,931,850.00
								1,998,318.91
Building Demolition Subtotal (without markup) =								\$8,495,144.24
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	1977.17	CY	0.00	75.00	22.75	0.00	193,269.32
17020401	Dump Charges	204	EA	0.00	0.00	0.00	265.00	54,060.00
Slab Demolition Subtotal (without markup) =								\$247,329.32
Total Cost (without markup) =								\$17,373,681.14

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-5
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 1 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	3920	SF	0.08	1.22	0.00	0.00	5,081.48
16020604	Remove Asbestos Pipe Insulation 4" - 6"	400	LF	0.33	6.09	0.04	0.00	2,580.46
16020614	Remove Asbestos Boiler Insulation	400	SF	0.48	10.05	0.00	0.00	4,209.58
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	4720	SF	0.05	0.18	0.00	0.00	1,107.86
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	47	EA	8.81	0.00	0.00	0.00	414.12
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	4720	SF	0.05	0.71	0.00	0.00	3,618.82
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	292	EA	0.00	1.19	0.00	0.00	348.83
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	54	EA	100.00	0.00	0.00	0.00	5,400.00
17030220	910, 1.25 CY, Wheel Loader	2	HR	0.00	70.55	30.81	0.00	202.74
17030284	8 CY, Dump Truck	10	HR	0.00	65.67	46.09	0.00	1,117.53
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	5	EA	23.02	0.00	0.00	0.00	115.09
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	5	EA	15.69	0.00	0.00	0.00	78.46
33020401	Disposable Materials per Sample	25	EA	10.34	0.00	0.00	0.00	258.57
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	15	EA	0.00	0.00	0.00	19.68	295.22
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	20	HR	0.00	75.99	0.00	0.00	1,519.80
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	8	HR	0.00	79.81	0.00	0.00	638.47
33220112	Field Technician	5	HR	0.00	38.20	0.00	0.00	190.99
33220114	Word Processing/Clerical	5	HR	0.00	41.02	0.00	0.00	205.09
33220115	Draftsman/CADD	5	HR	0.00	43.99	0.00	0.00	219.93
Asbestos Removal Subtotal (without markup) =								\$34,839.20

TABLE B-5
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 1 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes							
17020107	Foundation Demolition, Excludes Dump Fees	47040	CF	0.00	0.17	0.08	0.00	11,591.29
17020401	Dump Charges	775	EA	0.00	0.00	0.00	265.00	205,375.03
Building Demolition Subtotal (without markup) =								\$216,966.31
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	48.4	CY	0.00	75.00	22.75	0.00	4,731.12
17020401	Dump Charges	46	EA	0.00	0.00	0.00	265.00	12,190.00
Slab Demolition Subtotal (without markup) =								\$16,921.12
Total Cost (without markup) =								\$268,726.64

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LF	Linear foot
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-6
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 2 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	37279	SF	0.08	1.22	0.00	0.00	48,324.63
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	37279	SF	0.05	0.18	0.00	0.00	8,750.01
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	7	EA	30.20	74.67	0.00	0.00	734.02
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	100	EA	8.81	0.00	0.00	0.00	881.10
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	37279	SF	0.05	0.71	0.00	0.00	28,581.79
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	3029	EA	0.00	1.19	0.00	0.00	3,618.57
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	561	EA	100.00	0.00	0.00	0.00	56,100.00
17030221	916, 1.5 CY, Wheel Loader	10	HR	0.00	70.55	25.40	0.00	959.51
17030285	12 CY, Dump Truck	68	HR	0.00	65.67	43.29	0.00	7,408.90
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	12	EA	23.02	0.00	0.00	0.00	276.21
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	12	EA	15.69	0.00	0.00	0.00	188.30
33020401	Disposable Materials per Sample	19	EA	10.34	0.00	0.00	0.00	196.51
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	14	HR	0.00	75.99	0.00	0.00	1,063.86
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	38	HR	0.00	79.81	0.00	0.00	3,032.72
33220112	Field Technician	4	HR	0.00	38.20	0.00	0.00	152.79
33220114	Word Processing/Clerical	4	HR	0.00	41.02	0.00	0.00	164.07
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
Asbestos Removal Subtotal (without markup) =								\$167,458.58
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	446400	CF	0.00	0.17	0.08	0.00	109,998.95
17020401	Dump Charges	7322	EA	0.00	0.00	0.00	265.00	1,940,330.25
Building Demolition Subtotal (without markup) =								\$2,050,329.20

TABLE B-6
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 2 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	459.26	CY	0.00	75.00	22.75	0.00	44,892.89
17020401	Dump Charges	431	EA	0.00	0.00	0.00	265.00	114,215.00
Slab Demolition Subtotal (without markup) =								\$159,107.89
Total Cost (without markup) =								\$2,376,895.66

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-7
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 3 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	15273	SF	0.08	1.22	0.00	0.00	19,798.33
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	15273	SF	0.05	0.18	0.00	0.00	3,584.83
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	41	EA	8.81	0.00	0.00	0.00	361.25
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	15273	SF	0.05	0.71	0.00	0.00	11,709.80
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	1241	EA	0.00	1.19	0.00	0.00	1,482.55
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	230	EA	100.00	0.00	0.00	0.00	23,000.00
17030220	910, 1.25 CY, Wheel Loader	5	HR	0.00	70.55	30.81	0.00	506.84
17030284	8 CY, Dump Truck	39	HR	0.00	65.67	46.09	0.00	4,358.38
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	8	EA	23.02	0.00	0.00	0.00	184.14
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	8	EA	15.69	0.00	0.00	0.00	125.53
33020401	Disposable Materials per Sample	17	EA	10.34	0.00	0.00	0.00	175.83
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	12	HR	0.00	75.99	0.00	0.00	911.88
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	16	HR	0.00	79.81	0.00	0.00	1,276.93
33220112	Field Technician	3	HR	0.00	38.20	0.00	0.00	114.59
33220114	Word Processing/Clerical	3	HR	0.00	41.02	0.00	0.00	123.06
33220115	Draftsman/CADD	3	HR	0.00	43.99	0.00	0.00	131.96
Asbestos Removal Subtotal (without markup) =								\$75,219.84

TABLE B-7
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDING 3 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	212800	CF	0.00	0.13	0.06	0.00	41,110.33
17020401	Dump Charges	4366	EA	0.00	0.00	0.00	265.00	1,156,990.15
Building Demolition (without markup) =								\$1,198,100.48
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	246.91	CY	0.00	75.00	22.75	0.00	24,135.57
17020401	Dump Charges	232	EA	0.00	0.00	0.00	265.00	61,480.00
Slab Demolition (without markup) =								\$85,615.57
Total Cost (without markup) =								\$1,358,935.89

Notes:	
CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency pariculate air
HR	Hour
LS	Lump sum
NIOSH	Nationial Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-8
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
MAINTENANCE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	148.15	CY	0.00	75.00	22.75	0.00	14,481.73
17020401	Dump Charges	139	EA	0.00	0.00	0.00	265.00	36,835.00
Slab Demolition Subtotal (without markup) =								\$51,316.73
Total Cost (without markup) =								\$51,316.73

Notes:

CY Cubic yard
EA Each

TABLE B-9
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
BUILDINGS 4 AND 5 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	1234.57	CY	0.00	75.00	22.75	0.00	120,679.81
17020401	Dump Charges	1158	EA	0.00	0.00	0.00	265.00	306,870.00
Slab Demolition Subtotal (without markup) =								\$427,549.81
Total Cost (without markup) =								\$427,549.81

Notes:

CY Cubic yard
EA Each

TABLE B-10
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
WALKWAY DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
	Single-level, Steel, Nonexplosive, Building Demolition, Excludes							
17020105	Foundation Demolition, Excludes Dump Fees	5760	CF	0.00	0.13	0.06	0.00	1,112.76
17020401	Dump Charges	196	EA	15.00	0.00	0.00	0.00	2,940.00
17030220	910, 1.25 CY, Wheel Loader	4	HR	0.00	70.55	30.81	0.00	405.47
17030284	8 CY, Dump Truck	33	HR	0.00	65.67	46.09	0.00	3,687.86
Building Demolition Subtotal (without markup) =								\$8,146.09
Total Cost (without markup) =								\$8,146.09

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HR	Hour

TABLE B-11
ALTERNATIVE 2 - BUILDING DEMOLITION AND DISPOSAL
DETAILED COST ESTIMATE
EARTHWORK

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Earthwork								
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	192.59	CY	25.92	1.09	0.89	0.01	5,374.88
18050301	Loam or topsoil, imported topsoil, 6" deep, furnish and place	4338.65	LCY	33.17	5.82	1.81	0.00	177,015.44
18050402	Seeding, Vegetative Cover	8.07	ACR	3,288.62	498.59	207.57	0.00	32,237.86
33010102	Sample collection, vehicles, van or pickup rental	30	DAY	0.00	0.00	0.00	72.84	2,185.33
33010114	Mobilization Equipment (Soils)	4	LS	0.00	1,838.62	1,762.78	0.00	14,405.63
33010115	Demobilize Equipment (Soils)	4	LS	0.00	1,838.62	1,762.78	0.00	14,405.63
33010204	Mobilize Crew, 100 Miles, per Person	6	EA	0.00	0.00	0.00	128.16	768.97
33080532	Geotextile Fabric, Non-Woven 80 Mil	39047.89	SY	0.97	0.92	0.03	0.00	74,738.83
Earthwork Subtotal (without markup) =								\$321,132.57
Total Cost (without markup) =								\$321,132.57

Notes:

ACR	Acre
CY	Cubic yard
EA	Each
LCY	Loose cubic yards
LS	Lump sum
SY	Square yard

TABLE B-12
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
ASBESTOS SURVEY

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Survey								
33010104	Sample collection, vehicle mileage charge, car or van	420	MI	0.00	0.00	0.00	0.51	214.20
33010202	Per Diem (per person)	6	DAY	0.00	0.00	0.00	144.00	864.00
33020603	Surface Soil Sampling Equipment	1	EA	491.09	0.00	0.00	0.00	491.09
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	100	EA	0.00	0.00	0.00	19.68	1,968.12
33220102	Project Manager	3	HR	0.00	91.12	0.00	0.00	273.37
33220108	Project Scientist	10	HR	0.00	75.99	0.00	0.00	759.90
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220112	Field Technician	48	HR	0.00	38.20	0.00	0.00	1,833.46
33220114	Word Processing/Clerical	2	HR	0.00	41.02	0.00	0.00	82.04
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
33240101	Other Direct Costs	1	LS	148.27	0.00	0.00	0.00	148.27
Asbestos Survey Subtotal (without markup) =								\$6,962.37
Total Cost (without markup) =								\$6,962.37

Notes:

DAY	Day
EA	Each
HR	Hour
LS	Lump sum
MI	Mile
PLM	Professional labor management
QA	Quality assurance
QC	Quality control

TABLE B-13
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
EQUIPMENT DECONTAMINATION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Off-site Transportation and Disposal								
33190103	Load Drums on Disposal Vehicle	50	EA	0.00	5.62	1.63	0.00	362.60
33190108	Tanker Pumping Equipment to Load Liquid	1	HR	0.00	0.00	0.00	26.69	26.69
33190204	Transport 55 Gallon Drums of Hazardous Waste, Max 80 drums (per Mile)	200	MI	0.00	0.00	0.00	2.57	514.80
33190317	Waste Stream Evaluation Fee, Not Including 50% Rebate on 1st Shipment	1	EA	0.00	0.00	0.00	49.50	49.50
33197217	Landfill Drummed Liquid Waste Requiring Stabilization, 55 Gallon Drum	50	EA	0.00	0.00	0.00	173.58	8,678.84
Off-site Transportation and Disposal Subtotal (without margins) =								\$9,632.43
Decontamination Facilities								
17030109	Pad Subgrade Preparation	133.33	CY	0.00	5.77	1.51	0.00	971.44
	Cat 215, 1.0 CY, Soil, Shallow, Trenching, Excludes Sheeting, Excludes							
17030257	Dewatering	2.49	BCY	0.00	0.77	0.30	0.00	2.68
17030501	Compaction, subgrade, 18" wide, 8" lifts, walk behind, vibrating plate	133.33	ECY	0.00	2.60	0.14	0.00	364.68
17030510	Dry Roll Gravel, Steel Roller	200	SY	0.00	0.88	0.30	0.00	236.36
18010102	Gravel, Delivered & Dumped	55.56	CY	23.76	6.73	6.35	0.00	2,046.97
18010103	Gravel (90%) & Sand Base (10%), with Calcium Chloride 3/4 - 1 Lb/CY	55.56	CY	4.01	0.32	0.28	0.00	256.32
18010201	Concrete Curb, 6" x 6"	166	LF	3.58	1.55	0.00	0.00	852.63
18020203	26" x 26", 5' Deep Area Drain with Grate	1	EA	1,287.00	2,224.33	35.20	0.00	3,546.53
18020321	6" Structural Slab on Grade	1500	SF	3.56	2.85	0.08	0.00	9,727.44
19020313	5' x 5' x 5' Reinforced Concrete Sump	1	EA	1,462.32	2,954.42	55.12	0.00	4,471.86
19020604	12" x 12" CIP Concrete In-Ground Trench Drain with Metal Grate	28	LF	63.91	58.19	0.36	0.00	3,428.93
	5,000 Gallon Steel Sump, Aboveground with Supports & Fittings, Excludes							
19040606	Foundation, Pumps, Piping	1	EA	18,909.00	818.03	0.00	0.00	19,727.03
33080503	Polymeric Liner Anchor Trench, 3' x 1.5'	199.2	LF	0.19	2.19	0.34	0.00	543.09
33080532	Geotextile Fabric, Non-Woven 80 Mil	200	SY	0.97	0.92	0.03	0.00	382.81
33080571	40 Mil Polymeric Liner, High-density Polyethylene	1800	SF	0.35	0.24	0.02	0.00	1,087.23
33170818	Spray washers, cold water, electric, 1800 psi, 5 GPM, 5 HP, rent/month	1	MO	0.00	0.00	0.00	684.09	684.09
33170823	Operation of Pressure Washer, Including Water, Soap, Electricity, Labor	10	HR	0.00	74.33	0.00	0.00	743.34
33231306	High Sump Level Switch for Avoiding Overflow	1	EA	154.50	0.00	0.00	0.00	154.50
33260623	(2 1/2", 4") PVC Double-wall Piping, with Fittings	30	LF	45.46	34.76	0.00	0.00	2,406.57
33290401	Pump, pedestal sump, single stage, 25 GPM, 1 H.P., 1-1/2" discharge	1	EA	3,415.50	665.63	0.00	0.00	4,081.13
Decontamination Facilities Subtotal (without margins) =								\$55,715.63
Total Cost (without margins) =								\$65,348.06

TABLE B-13
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
EQUIPMENT DECONTAMINATION

Notes:

BCY	Bank cubic yard
CY	Cubic yard
EA	Each
ECY	Embankment cubic yard
GPM	Gallons per minute
HP	Horsepower
HR	Hour
lb	Pound
LF	Linear foot
LS	Lump sum
MI	Mile
MO	Month
PVC	Polyvinyl choride
SF	Square foot
SY	Square yard

TABLE B-14
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
CAPPING

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Cap								
17030422	Unclassified Fill, 6" Lifts, On-Site, Includes Spreading and Compaction	74303.96	CY	1.17	2.99	2.35	0.01	484,582.21
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	12383.99	CY	25.92	1.09	0.89	0.01	345,617.73
18020302	Asphalt Pavement- 6" Base Course Layer, 3" Topping	59443.17	SY	31.28	4.51	1.49	0.00	2,216,687.17
33080507	Clay, Low Permeability, 6"Lifts, Off-Site	55480.29	CY	25.92	2.56	1.79	0.00	1,679,063.05
33080513	Drainage Netting, Geotextile Fabric Heat-bonded 2 Sides	588487.4	SF	0.57	0.10	0.01	0.00	398,529.97
33080571	40 Mil Polymeric Liner, High-density Polyethylene	588487.4	SF	0.35	0.24	0.02	0.00	355,455.75
Cap Subtotal (without markup) =								\$5,479,935.87
Total Cost (without markup) =								\$5,479,935.87

Notes:

CY	Cubic yard
SF	Square feet
SY	Square yard

TABLE B-15
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
OFFICE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	144000	CF	0.00	0.17	0.08	0.00	35,483.53
17020401	Dump Charges	369	EA	15.00	0.00	0.00	0.00	5,534.99
17030220	910, 1.25 CY, Wheel Loader	7	HR	0.00	70.55	30.81	0.00	709.57
17030284	8 CY, Dump Truck	62	HR	0.00	65.67	46.09	0.00	6,928.71
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	11	HR	0.00	315.34	185.84	0.00	5,512.99
								54,169.80
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	98560	CF	0.00	0.17	0.08	0.00	24,286.51
17020401	Dump Charges	272	EA	15.00	0.00	0.00	0.00	4,080.00
17030220	910, 1.25 CY, Wheel Loader	6	HR	0.00	70.55	30.81	0.00	608.21
17030284	8 CY, Dump Truck	46	HR	0.00	65.67	46.09	0.00	5,140.66
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	8	HR	0.00	315.34	185.84	0.00	4,009.45
								38,124.81
17020106	Single-level, Concrete, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	5400	CF	0.00	0.17	0.08	0.00	1,330.63
17020401	Dump Charges	15	EA	15.00	0.00	0.00	0.00	225.00
17030220	910, 1.25 CY, Wheel Loader	1	HR	0.00	70.55	30.81	0.00	101.37
17030284	8 CY, Dump Truck	4	HR	0.00	65.67	46.09	0.00	447.01
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	1	HR	0.00	315.34	185.84	0.00	501.18
								2,605.19
Building Demolition Subtotal (without markup) =								\$94,899.81
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	216.79	CY	0.00	75.00	22.75	0.00	21,191.33
17020401	Dump Charges	4	EA	15.00	0.00	0.00	0.00	60.00
17030220	910, 1.25 CY, Wheel Loader	1	HR	0.00	70.55	30.81	0.00	101.37
17030284	8 CY, Dump Truck	2	HR	0.00	65.67	46.09	0.00	223.51
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	8	HR	0.00	367.40	100.21	0.00	3,740.85
Slab Demolition Subtotal (without markup) =								\$25,317.05
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	18160	SF	0.08	1.22	0.00	0.00	23,540.74
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30

TABLE B-15
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
OFFICE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	49	EA	8.81	0.00	0.00	0.00	431.74
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	1476	EA	0.00	1.19	0.00	0.00	1,763.29
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	274	EA	100.00	0.00	0.00	0.00	27,400.00
17030220	910, 1.25 CY, Wheel Loader	6	HR	0.00	70.55	30.81	0.00	608.21
17030284	8 CY, Dump Truck	46	HR	0.00	65.67	46.09	0.00	5,140.66
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	4	EA	23.02	0.00	0.00	0.00	92.07
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	4	EA	15.69	0.00	0.00	0.00	62.77
33020401	Disposable Materials per Sample	17	EA	10.34	0.00	0.00	0.00	175.83
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	12	HR	0.00	75.99	0.00	0.00	911.88
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	19	HR	0.00	79.81	0.00	0.00	1,516.36
33220112	Field Technician	3	HR	0.00	38.20	0.00	0.00	114.59
33220114	Word Processing/Clerical	3	HR	0.00	41.02	0.00	0.00	123.06
33220115	Draftsman/CADD	3	HR	0.00	43.99	0.00	0.00	131.96
Asbestos Removal Subtotal (without markup) =								\$69,387.08
Total Cost (without markup) =								\$284,503.74

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-16
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
PRODUCTION BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	29296	SF	0.08	1.22	0.00	0.00	37,976.30
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	29296	SF	0.05	0.18	0.00	0.00	6,876.27
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	6	EA	30.20	74.67	0.00	0.00	629.16
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	79	EA	8.81	0.00	0.00	0.00	696.07
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	29296	SF	0.05	0.71	0.00	0.00	22,461.23
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	2381	EA	0.00	1.19	0.00	0.00	2,844.44
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	441	EA	100.00	0.00	0.00	0.00	44,100.00
17030220	910, 1.25 CY, Wheel Loader	9	HR	0.00	70.55	30.81	0.00	912.31
17030284	8 CY, Dump Truck	74	HR	0.00	65.67	46.09	0.00	8,269.75
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	10	EA	23.02	0.00	0.00	0.00	230.18
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	10	EA	15.69	0.00	0.00	0.00	156.92
33020401	Disposable Materials per Sample	18	EA	10.34	0.00	0.00	0.00	186.17
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	13	HR	0.00	75.99	0.00	0.00	987.87
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	30	HR	0.00	79.81	0.00	0.00	2,394.25
33220112	Field Technician	4	HR	0.00	38.20	0.00	0.00	152.79
33220114	Word Processing/Clerical	4	HR	0.00	41.02	0.00	0.00	164.07
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
Asbestos Removal Subtotal (without markup) =								\$136,063.35
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	413952	CF	0.00	0.17	0.08	0.00	102,003.33
17020401	Dump Charges	684	EA	0.00	0.00	0.00	265.00	181,260.02
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	31	HR	0.00	315.34	185.84	0.00	15,536.61
								298,799.96

TABLE B-16
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
PRODUCTION BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	518448	CF	0.00	0.17	0.08	0.00	127,752.54
17020401	Dump Charges	892	EA	0.00	0.00	0.00	265.00	236,380.03
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	41	HR	0.00	315.34	185.84	0.00	20,548.42
								384,680.99
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	381720	CF	0.00	0.17	0.08	0.00	94,060.93
17020401	Dump Charges	657	EA	0.00	0.00	0.00	265.00	174,105.02
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	30	HR	0.00	315.34	185.84	0.00	15,035.43
								283,201.38
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	54168	CF	0.00	0.17	0.08	0.00	13,347.72
17020401	Dump Charges	94	EA	0.00	0.00	0.00	265.00	24,910.00
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	5	HR	0.00	315.34	185.84	0.00	2,505.90
								40,763.63
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation	344064	CF	0.00	0.13	0.06	0.00	66,468.91
17020401	Dump Charges	7290	EA	0.00	0.00	0.00	265.00	1,931,850.00
								1,998,318.91
								Building Demolition Subtotal (without markup) = \$3,005,764.87
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	1977.17	CY	0.00	75.00	22.75	0.00	193,269.32
17020401	Dump Charges	19	EA	0.00	0.00	0.00	265.00	5,035.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	16	HR	0.00	367.40	100.21	0.00	7,481.70
								Slab Demolition Subtotal (without markup) = \$205,786.02
								Total Cost (without markup) = \$6,353,379.10

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-17
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 1 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	3920	SF	0.08	1.22	0.00	0.00	5,081.48
16020604	Remove Asbestos Pipe Insulation 4" - 6"	400	LF	0.33	6.09	0.04	0.00	2,580.46
16020614	Remove Asbestos Boiler Insulation	400	SF	0.48	10.05	0.00	0.00	4,209.58
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	4720	SF	0.05	0.18	0.00	0.00	1,107.86
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	47	EA	8.81	0.00	0.00	0.00	414.12
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	4720	SF	0.05	0.71	0.00	0.00	3,618.82
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	292	EA	0.00	1.19	0.00	0.00	348.83
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	54	EA	100.00	0.00	0.00	0.00	5,400.00
17030220	910, 1.25 CY, Wheel Loader	2	HR	0.00	70.55	30.81	0.00	202.74
17030284	8 CY, Dump Truck	10	HR	0.00	65.67	46.09	0.00	1,117.53
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	5	EA	23.02	0.00	0.00	0.00	115.09
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	5	EA	15.69	0.00	0.00	0.00	78.46
33020401	Disposable Materials per Sample	25	EA	10.34	0.00	0.00	0.00	258.57
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	15	EA	0.00	0.00	0.00	19.68	295.22
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	20	HR	0.00	75.99	0.00	0.00	1,519.80
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	8	HR	0.00	79.81	0.00	0.00	638.47
33220112	Field Technician	5	HR	0.00	38.20	0.00	0.00	190.99
33220114	Word Processing/Clerical	5	HR	0.00	41.02	0.00	0.00	205.09
33220115	Draftsman/CADD	5	HR	0.00	43.99	0.00	0.00	219.93
Asbestos Removal Subtotal (without markup) =								\$34,839.20
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	47040	CF	0.00	0.17	0.08	0.00	11,591.29
17020401	Dump Charges	78	EA	0.00	0.00	0.00	265.00	20,670.00

TABLE B-17
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 1 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	4	HR	0.00	315.34	185.84	0.00	2,004.72
Building Demolition Subtotal (without markup) =								\$34,266.01
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	48.4	CY	0.00	75.00	22.75	0.00	4,731.12
17020401	Dump Charges	1	EA	0.00	0.00	0.00	265.00	265.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	8	HR	0.00	367.40	100.21	0.00	3,740.85
Slab Demolition Subtotal (without markup) =								\$8,736.97
Total Cost (without markup) =								\$77,842.19

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency particulate air
HR	Hour
LF	Linear foot
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-18
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 2 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	37279	SF	0.08	1.22	0.00	0.00	48,324.63
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	37279	SF	0.05	0.18	0.00	0.00	8,750.01
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	7	EA	30.20	74.67	0.00	0.00	734.02
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	100	EA	8.81	0.00	0.00	0.00	881.10
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	37279	SF	0.05	0.71	0.00	0.00	28,581.79
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	3029	EA	0.00	1.19	0.00	0.00	3,618.57
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	561	EA	100.00	0.00	0.00	0.00	56,100.00
17030221	916, 1.5 CY, Wheel Loader	10	HR	0.00	70.55	25.40	0.00	959.51
17030285	12 CY, Dump Truck	68	HR	0.00	65.67	43.29	0.00	7,408.90
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	12	EA	23.02	0.00	0.00	0.00	276.21
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	12	EA	15.69	0.00	0.00	0.00	188.30
33020401	Disposable Materials per Sample	19	EA	10.34	0.00	0.00	0.00	196.51
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	14	HR	0.00	75.99	0.00	0.00	1,063.86
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	38	HR	0.00	79.81	0.00	0.00	3,032.72
33220112	Field Technician	4	HR	0.00	38.20	0.00	0.00	152.79
33220114	Word Processing/Clerical	4	HR	0.00	41.02	0.00	0.00	164.07
33220115	Draftsman/CADD	4	HR	0.00	43.99	0.00	0.00	175.94
Asbestos Removal Subtotal (without markup) =								\$167,458.58
Building Demolition								
17020107	Single-level, Masonry, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	446400	CF	0.00	0.17	0.08	0.00	109,998.95
17020401	Dump Charges	733	EA	0.00	0.00	0.00	265.00	194,245.03
17039902	Crusher (200 Tons/Hour) Including 950 & 953 Loaders	33	HR	0.00	315.34	185.84	0.00	16,538.97
Building Demolition Subtotal (without markup) =								\$320,782.94

TABLE B-18
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 2 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	459.26	CY	0.00	75.00	22.75	0.00	44,892.89
17020401	Dump Charges	5	EA	0.00	0.00	0.00	265.00	1,325.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	8	HR	0.00	367.40	100.21	0.00	3,740.85
Slab Demolition (without markup) =								\$49,958.74
Total Cost (without markup) =								\$538,200.26

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency pariculate air
HR	Hour
LS	Lump sum
NIOSH	Nationial Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-19
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 3 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Asbestos Removal								
16020302	Remove Asbestos Shingle Roofing	15273	SF	0.08	1.22	0.00	0.00	19,798.33
16029002	Mobilization & Fee	1	LS	1,712.70	0.00	0.00	0.00	1,712.70
16029004	Pre-Clean, HEPA Vacuum and Wet Clean	15273	SF	0.05	0.18	0.00	0.00	3,584.83
16029006	Asbestos Abatement Work Area, erect barrier, wood frame with vision screen	500	SF	2.97	0.70	0.00	0.00	1,834.93
16029013	OSHA Testing, cleaned area samples, PCM air sample analysis, NIOSH 7400, minimum	5	EA	30.20	74.67	0.00	0.00	524.30
16029016	Asbestos Abatement Equip. & Supplies, Buy, worker protection, whole body, foot, head cover & gloves, plastic	41	EA	8.81	0.00	0.00	0.00	361.25
16029018	Decontamination Containment Area Demolition & Cleanup, post abatement visual inspection	1	EA	0.00	597.32	0.00	0.00	597.32
16029020	Post-Clean, High Efficiency Particulate Air Vacuum	15273	SF	0.05	0.71	0.00	0.00	11,709.80
16029022	Waste Packaging, Handling & Disposal, cart bags from work site to haul truck	1241	EA	0.00	1.19	0.00	0.00	1,482.55
16029026	Asbestos Abatement Work Area, decontamination chamber, portable, 3-Stage Decontamination Area, includes construct and removal	1	EA	579.15	1,148.00	141.03	0.00	1,868.18
17020401	Dump Charges	230	EA	100.00	0.00	0.00	0.00	23,000.00
17030220	910, 1.25 CY, Wheel Loader	5	HR	0.00	70.55	30.81	0.00	506.84
17030284	8 CY, Dump Truck	39	HR	0.00	65.67	46.09	0.00	4,358.38
25010419	Safety signs (yellow and magenta), aluminum/acrylic, 10" x 14"	8	EA	23.02	0.00	0.00	0.00	184.14
25010420	Safety signs (yellow and magenta), flexible self adhesive, 7" x 10"	8	EA	15.69	0.00	0.00	0.00	125.53
33020401	Disposable Materials per Sample	17	EA	10.34	0.00	0.00	0.00	175.83
33021779	Asbestos in Bulk Solids/Soils (Identification by PLM)	7	EA	0.00	0.00	0.00	19.68	137.77
33220102	Project Manager	6	HR	0.00	91.12	0.00	0.00	546.75
33220108	Project Scientist	12	HR	0.00	75.99	0.00	0.00	911.88
33220110	QA/QC Officer	2	HR	0.00	75.99	0.00	0.00	151.98
33220111	Certified Industrial Hygienist	16	HR	0.00	79.81	0.00	0.00	1,276.93
33220112	Field Technician	3	HR	0.00	38.20	0.00	0.00	114.59
33220114	Word Processing/Clerical	3	HR	0.00	41.02	0.00	0.00	123.06
33220115	Draftsman/CADD	3	HR	0.00	43.99	0.00	0.00	131.96
Asbestos Removal Subtotal (without markup) =								\$75,219.84
Building Demolition								
17020105	Single-level, Steel, Nonexplosive, Building Demolition, Excludes Foundation Demolition, Excludes Dump Fees	212800	CF	0.00	0.13	0.06	0.00	41,110.33
17020401	Dump Charges	4366	EA	0.00	0.00	0.00	265.00	1,156,990.15
Building Demolition Subtotal (without markup) =								\$1,198,100.48

TABLE B-19
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDING 3 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	246.91	CY	0.00	75.00	22.75	0.00	24,135.57
17020401	Dump Charges	3	EA	0.00	0.00	0.00	265.00	795.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	8	HR	0.00	367.40	100.21	0.00	3,740.85
Slab Demolition Subtotal (without markup) =								\$28,671.42
Total Cost (without markup) =								\$1,301,991.75

Notes:

CF	Cubic foot
CY	Cubic yard
EA	Each
HEPA	High-efficiency pariculate air
HR	Hour
LS	Lump sum
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PCM	Phase contrast microscopy
PLM	Professional labor management
QA	Quality assurance
QC	Quality control
SF	Square foot

TABLE B-20
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
MAINTENANCE BUILDING DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	148.15	CY	0.00	75.00	22.75	0.00	14,481.73
17020401	Dump Charges	2	EA	0.00	0.00	0.00	265.00	530.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	8	HR	0.00	367.40	100.21	0.00	3,740.85
Slab Demolition Subtotal (without markup) =								\$18,752.59
Total Cost (without markup) =								\$18,752.59

Notes:

CY Cubic yard
EA Each
HR Hour

TABLE B-21
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
BUILDINGS 4 5 DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Slab Demolition								
17020209	Demolish Rod Reinforced Concrete to 6" Thick with Power Equipment	1234.57	CY	0.00	75.00	22.75	0.00	120,679.81
17020401	Dump Charges	12	EA	0.00	0.00	0.00	265.00	3,180.00
33179924	CONCRETE PULVERIZER CREW (14.5" THICK)	16	HR	0.00	367.40	100.21	0.00	7,481.70
Slab Demolition Subtotal (without markup) =								\$131,341.51
Total Cost (without markup) =								\$131,341.51

Notes:

CY Cubic yard
EA Each
HR Hour

TABLE B-22
ALTERNATIVE 3 - BUILDING DEMOLITION AND CAPPING
DETAILED COST ESTIMATE
WALKWAY DEMOLITION

Assembly	Item Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	SubBid	Extended Cost
Building Demolition								
	Single-level, Steel, Nonexplosive, Building Demolition, Excludes							
17020105	Foundation Demolition, Excludes Dump Fees	5760	CF	0.00	0.13	0.06	0.00	1,112.76
17020401	Dump Charges	196	EA	15.00	0.00	0.00	0.00	2,940.00
17030220	910, 1.25 CY, Wheel Loader	4	HR	0.00	70.55	30.81	0.00	405.47
17030284	8 CY, Dump Truck	33	HR	0.00	65.67	46.09	0.00	3,687.86
Building Demolition Subtotal (without markup) =								\$8,146.09
Total Cost (without markup) =								\$8,146.09

Notes:

CF Cubic feet
CY Cubic yard
EA Each
HR Hour